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Feb.
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Veteran Water Department Employe Receives Honor
Skill Award Won By Turrell Official
Arlington Man Gets Water Work Rating

G. R. Herzik is Texas' State Sanitary Engineer (see page 18) and Texas Water and Sewage Works Association Secretary. Turn to page 103 for the story on the news clippings, an association PR effort.

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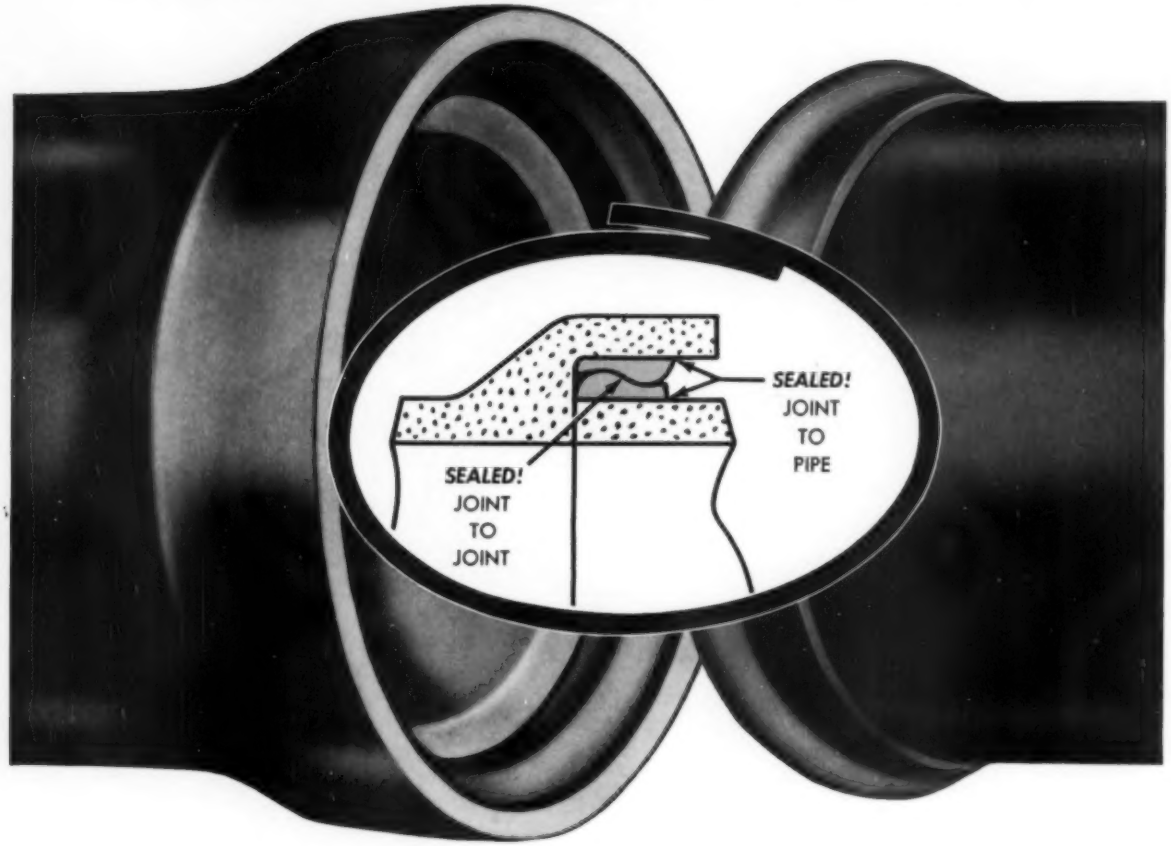

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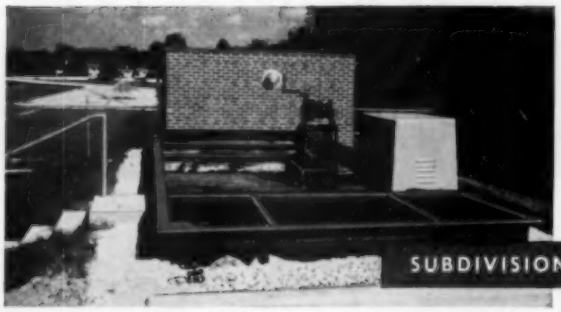
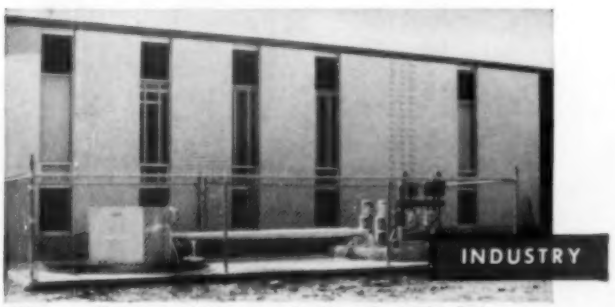
The Owensboro Sewer Pipe Co.....Owensboro, Ky.
Pomona Terra-Cotta Company..Greensboro, N.C.
The Robinson Clay Products Co......Akron, Ohio
Superior Clay Corporation.....Uhrichsville, Ohio



RAMS . . . Indianapolis, Indiana . . . RatedAeration, medium steel sewage treatment plant for design flows to 15,000 GPD. Factory fabricated with "Chicago" standardized balanced equipment. Engineer—Bevington, Taggart & Fowler. Bulletin 135-A.

RALC . . . Vacaville, California . . . Large concrete RatedAeration plant using "Chicago" sewage equipment throughout for more effective treatment. Capacities from 60,000 GPD. Engineer—M. Carlton Yoder. Ask for Bulletin 135-A.

RAMC . . . Hialeah, Florida . . . Above ground installation of a medium concrete treatment plant. Packaged standardized, balanced equipment for flows from 7,500 to 60,000 GPD. Engineer—Loyd Frank Vann Associates. Ask for Bulletin 135-A.



RASS . . . Meterie, Louisiana . . . Small steel, circular factory fabricated sewage treatment plant for communities from 10 to 500 people available in 1, 3, & 5,000 GPD capacities. Engineer—Curtis & Davis. Ask for Bulletin 136.

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SEWAGE TREATMENT
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Odor free, nuisance free, low cost, small package steel or large concrete plants . . . 1,000 to 1,000,000 GPD

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THE 85 HP NO. 112E Increased power, plus other quality features, keep the No. 112E out front in the 21,000 lb. class.

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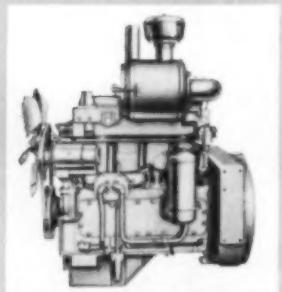
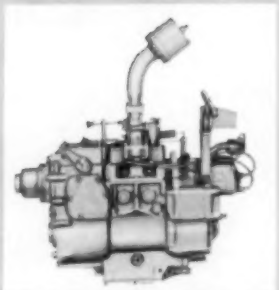
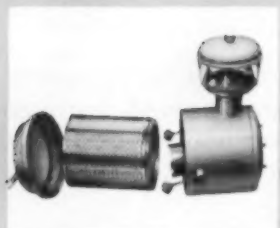
No other motor graders in the 85 HP to 100 HP range have all these features



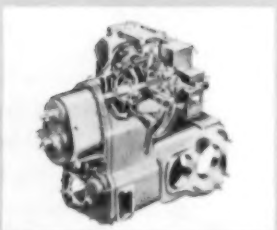
New compact engine: 85 HP in the No. 112E. Turbocharged 100 HP in the No. 112F.
Result: better lugging ability, long life, easier servicing.



Vertical starting engine: standard on both models.
Result: easy, all-weather starting.

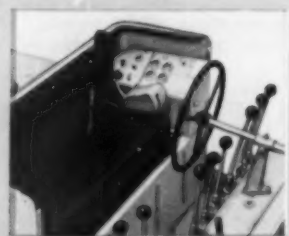


Dry-type air cleaner: standard on both models.
Result: removes 99.8 per cent of air-borne dirt from engine intake every service hour. Takes only five minutes to service.



Oil Clutch: standard on both models.
Result: up to 2000 hours of operation without adjustment.

Improved blade controls: standard on both models.
Result: precise adjustment, easy engagement—anti-creep lock makes blade stay put under load.



In-seat starting: standard on both models.
Result: finger-tip convenience and positive starts.

More and more municipalities, counties and townships are finding that the production and economy of Caterpillar Motor Graders save taxpayers' money. You can see the proof of this by asking your Caterpillar Dealer for a demonstration on your job. He backs up every machine he sells with reliable parts and dependable service to protect your investment.

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PUBLIC WORKS

THE MOST USEFUL ENGINEERING MAGAZINE FOR CITIES, COUNTIES AND STATE

FEBRUARY, 1961 • Volume 92, Number 2

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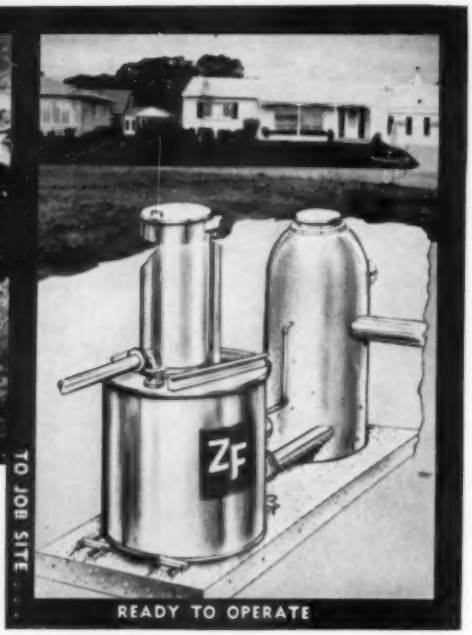

TO JOB SITE . . . READY TO OPERATE

A PACKAGED UNIT—completely shop-fitted with quality components throughout. Transported to job site ready for installation.

SIMPLIFIES LOCATION—underground operation permits use of existing public property such as parkways, etc. Saves cost of surface property and enclosing structure.

ECONOMICAL—saves costs and time. Prefabrication results in lower construction costs and less time at job site. Simply set in place, connect and start up.

COMPLETE DATA, SPECIFICATIONS AND DRAWINGS AVAILABLE—WRITE

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WALKER PROCESS **SPARJAIR COMPLETE SEWAGE TREATMENT PLANTS**

Designs for all Developments and Land Planning Projects

Hampton Pk. (Hsg. Devel.), Ill.—1 mgd tot. cap.

Finn Trailer Ct., Ill. (365 units)—45,500 gpd.

Hillcrest Shpg. Ctr., Joliet, Ill.—50,000 gpd.

Sparjair units overcome previous objections to locating a plant near residences, shopping areas, schools, etc. Its new but proven principle of Contact Stabilization aerates and thoroughly oxidizes all odor producing wastes.

Nested design provides complete treatment equal to large municipal plants.

1. Permits development of outlying, low cost land.
2. Capacities from 50 to 5000 population equivalent.
3. Eliminates septic tanks and drain fields.
4. Virtually automatic—Simple operation.
5. Approved by Health Authorities.
6. Odor free — no septic or stale operations.

Details and layouts are available to Consulting Engineers and their Architects, concerned with the design of package sewage and water treatment plants. Write factory at P. O. Box 266, Aurora, Ill. for complete information.

Walker Process also offers CLARIPURE Package Water Purification Plants—pre-designed capacities from 50 to 600 gpm.

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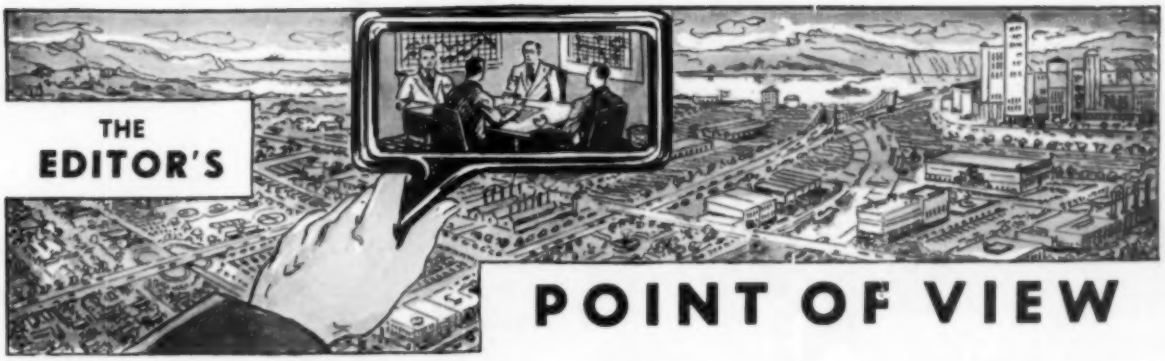

Construction is the Payoff

A READING of many of the papers presented at the recent conference on water pollution leaves one with the reaction that practically no one said anything about starting construction on the many thousand existing sources of pollution. More research is fine; but if we start to work now with our existing knowledge of waste treatment, we will do a lot more than we will by waiting years for more research results. Construction is the pay-off; why not start? There are 50 state health departments with machinery more or less capable of getting things done. If even half of them put on pressure for starting now, we would see the greatest advance in the next five years in pollution control that we have ever seen. What we badly need is leadership for action.

Weather Prediction—SNOW

THE PLEASANT fall weather in the East during early December led some people to feel that old-fashioned winters were a thing of the past. Reality came in the form of a 17-inch snow along the populous and busy eastern seaboard on Dec. 12. Aided by a somewhat optimistic report by the Weather man ("4 inches or *more*"), some cities, counties, villages and states seem to have held back a mite in putting equipment into action. To add to their troubles, winds of 50 miles an hour reformed drifts and filled in plow tracks quickly. Finally, temperatures near zero and not above 20 for two days and three nights handicapped the work.

There is no implied criticism of snow removal authorities in this. They did their best in all the cases we observed. In some places equipment was lacking or was too old to stand up—a thing that should not be permitted when so many people are dependent on our highways, and a thing that a relatively small amount of money could remedy. But, most of it can be summed up by paraphrasing an old statement and saying that, in winter, the life of the man responsible for snow removal is not always a happy one.

The Future of Branch Water

BRANCH WATER has long had a recognized place in our economy as an admixture for certain anti-freeze compounds. Now that a bigger and more effective pollution control program is proposed, the character of branch water may change, and addicts to its use may have to adjust to a new flavor. Our streams have, for years, carried an increasing load of pollution while the demand for water has likewise increased. This nation is now at the point where it can no longer tolerate the present condition of its water resources. A program of waste treatment and control is vitally necessary and the one proposed at the recent Washington meeting appears sound and needed. However, the accomplishment of this task will require many years; in the meantime, users of branch water can adjust their taste buds to the gradual elimination of that inimitable branch water flavor that has come down from the past.

Service Areas for the Interstate Highway System

THERE WILL be no service areas—gasoline, food and rest rooms—on the Interstate Highway System. That means that private enterprise will create such services at important intersections just off the highway system. In a sense, it is unfortunate that this will be necessary because controls will be immeasurably more difficult with the lack of regulation that will exist. There will be problems in water supply and in waste disposal; and probably also in traffic regulation and control since a busy service area at an exit or entrance could add enough local traffic to interfere.

It seems to us that this problem ought to be considered well in advance of need. There are three units of government that can contribute. The State Highway Department, through its knowledge of traffic conditions should be able to pinpoint the areas most likely to contribute developments; the state sanitary engineering department should learn of these areas and make preliminary studies of the conditions at them; the local community must take steps to provide necessary governmental controls. This may be by city or village action; by the county or township where there is no other municipality with power; or by action of a special sanitary or other district.

Neglect of these ordinary precautions will, in many cases, result in situations that will be problems for many years to come. Prevention will be far better than attempted cure. The situation calls for early and aggressive cooperation between highway and sanitary engineers.

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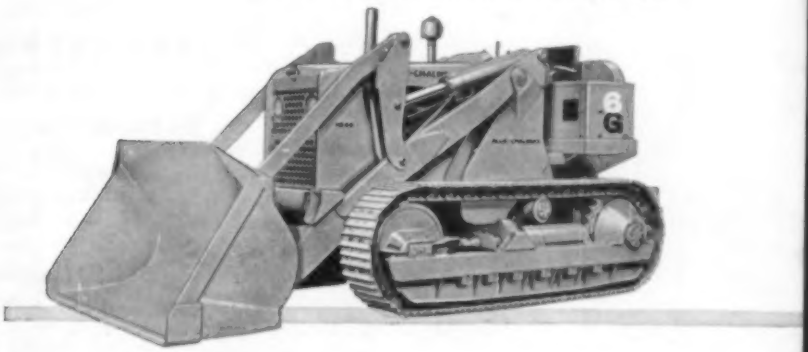
Now available in Persian Orange or Allis-Chalmers Yellow at no extra cost.



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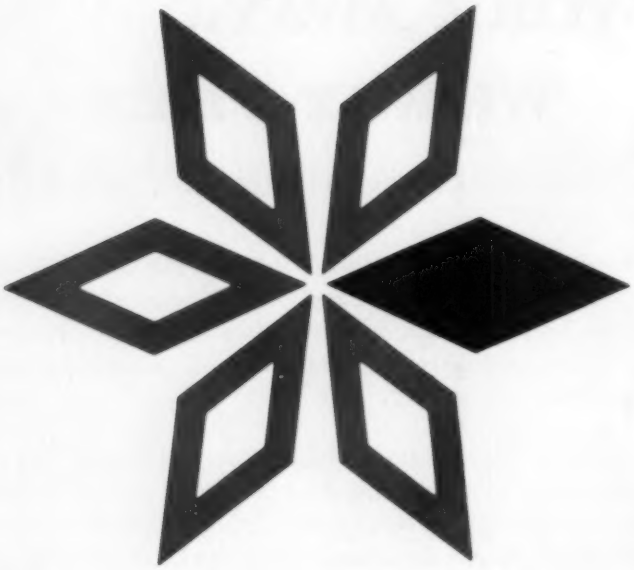

The New Symbol for Salt

. . . the most necessary element in the diets of both man and beast. Today salt is more significant to living than ever before. There are more than 80 varieties required by industry which has found some 14,000 uses.

Since 1886, Diamond Crystal Salt Company has been and is today, one of the country's leading producers of quality salt.

We introduce with pride our vigorous new symbol—the crystal formed of diamonds you see on this page. It represents total quality, backed by a progressive organization.

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Learn exactly what these new storage depots can mean to you. Call or write the nearest Diamond Crystal sales office.

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PLANTS: AKRON, OHIO; JEFFERSON ISLAND, LA.; ST. CLAIR, MICH.
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Rugged pipe installs easily –even in a soggy bed

This 30″ cast iron pipe was installed for expansion of a water system in Memphis, Tennessee.

Despite heavy rains, the pipe went right to bed in wet trenches. Upon completion, the mains were tested at 150 psi for 12 hours and were found to be bottle-tight.

Cement-lined cast iron pipe prevents pipe-clogging . . . always delivers a full flow of water. Bottle-tight joints are tight enough to resist hundreds of pounds of pressure per square inch . . . yet flexible enough to permit deflection both during and after installation.

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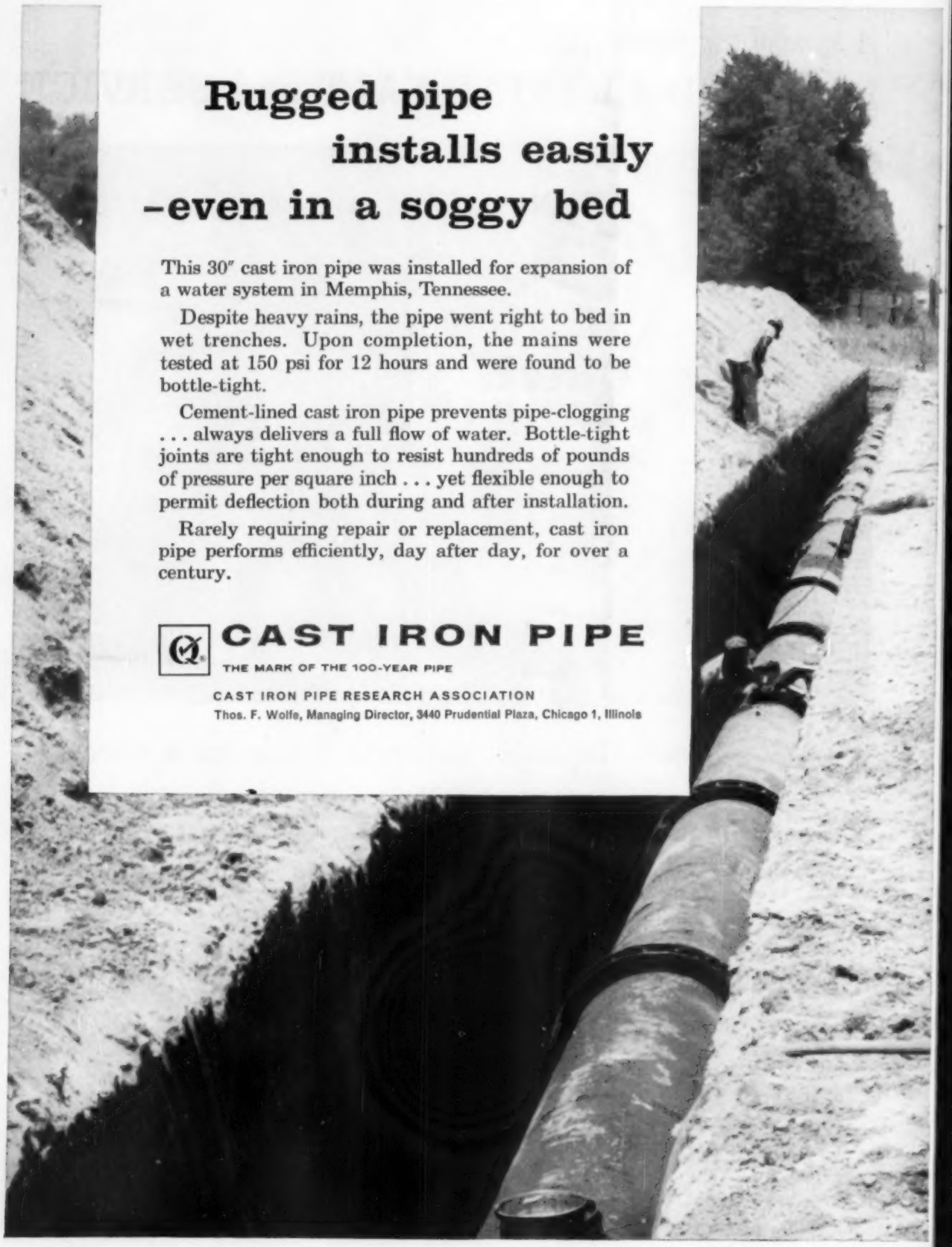
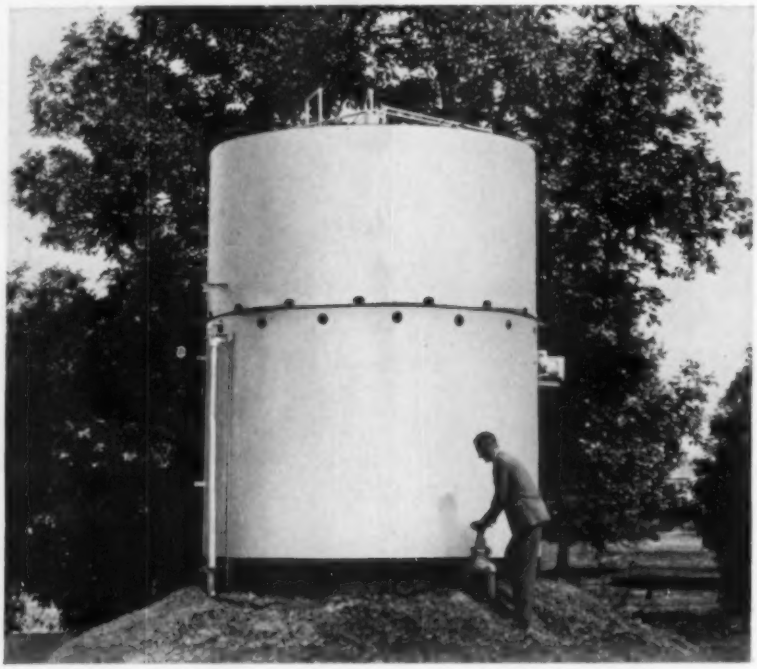


Link-Belt's creative answer to a critical problem:

"Big-city" sewage processing on a small-capacity scale

BIO-PAC

single-unit sewage treatment replaces old-fashioned disposal methods with modern, fully automatic processing



With the population spread proceeding at a rapid pace — with antipollution regulations increasing at a comparable rate — outlying areas face obsolescence of traditional sewage disposal methods.

Housing developments, industrial plants, shopping centers, schools and institutions, motels and trailer courts—all must cope with the problem of updating their methods of sewage disposal. And Link-Belt's practical answer to this problem is Bio-Pac—a modern, compact, bio-filtration sewage treatment system, designed to operate efficiently, and at low cost, in areas remote from metropolitan sewerage service.

Bio-Pac is a result of specialization —40 years of Link-Belt experience, working closely with consulting and municipal engineers, in the design and construction of industrial and metropolitan sewage treatment equipment.

As a result of this specialization, Bio-Pac represents a functional scaling down of large-capacity plant concepts. Single units are available in capacities to handle the sewage needs of 50 to 500 people. And this scaling down is a matter of size alone—no compromise of quality. Every Bio-Pac unit is a complete bio-filtration system . . . built to meet the Ten State Standards for sewage works.

Bio-Pac quality is underlined by design that delivers full two-stage treatment — featuring bio-filtration, the standard process, tested and proven in metropolitan sewage treatment plants. Even under adverse conditions, a consistently stable effluent is produced. And the system readily absorbs the shock loads which frequently upset aeration-type units. Moreover, high performance is accompanied by low operating costs. Because the Bio-Pac process is entirely automatic, it calls for only part-time care (and this by personnel who needn't be highly trained).

FREE FOLDER 2971 tells the story of Bio-Pac in detail. Contact the nearest Link-Belt office for your copy.

The remarkable overall compactness of the Link-Belt Bio-Pac offers a two-way bonus in terms of flexible installation. For example, consider the 11′-6″ diameter unit illustrated above (designed to serve 150 people). As shown, height above ground is just 13 feet. Compact? Of course! But with pit installation, even greater "hide-away" possibilities can be obtained—above-ground height of only 5 feet 7 inches. It all adds up to this welcome fact . . . Bio-Pac can be made to blend with its surroundings as easily as the familiar water storage facilities.

LINK-BELT

SANITARY ENGINEERING EQUIPMENT

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Mowing costs plunge when you equip your International® tractors with new high-speed International balanced head highway mowers. New vibration-free mower boosts cutting capacity—lets operators mow as fast as safe driving dictates. Mowing is amazingly smooth and quiet . . . wear and tear is reduced . . . operator fatigue is lessened. New cutter bar design gives non-clog cutting in all conditions. The mower is heavily constructed for steady, high-speed highway mowing. Cutter bar is 40 per cent stronger than conventional cutter bars, and is available in 5 to 9-foot lengths to match any highway mowing condition.

Exclusive IH balanced head drive eliminates pitman and gears . . . gives high-speed sickle action and permanent alignment for lowest maintenance of any cutter bar mower available.

INTERNATIONAL HARVESTER

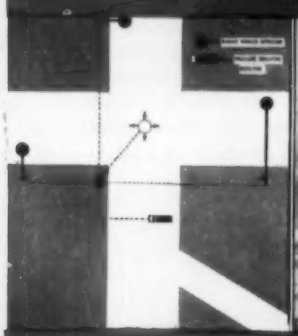
here are 8 reasons why the ELECTRO-MATIC® RADAR VEHICLE DETECTOR solves more traffic signal problems:

1. Now the new Model RD-2 Radar Vehicle Detector meets requirements of all types of traffic-actuated signal controllers.

2. Convenient overhead installation eliminates costly, time-consuming excavations and detours encountered with other detectors.

3. Beam width can be adjusted by remote control to cover from one 9-foot lane, up to three traffic lanes as desired.

4. Operation is not subject to traffic wear and is unaffected by parked cars, weather, or extraneous radio interference.



5. New "one car equals two impulses" feature permits RD-2 to be used in combination with existing pressure detectors on same traffic phase.

6. Radar Detectors may be mast arm mounted on existing wood or steel poles using standard luminaire-type mast arms.

7. Mounted on rigid 2-wire span, one or more Radar Detectors can be suspended in positions difficult for other detectors and mountings.

8. Keeps costs down because of ease of maintenance and removal in the event of roadway changes.

Give your intersections the newest in vehicle detection, and in doing so, save both time and money. Write for Bulletin D-165.

TRAFFIC ACTUATED

AUTOMATIC SIGNAL DIVISION

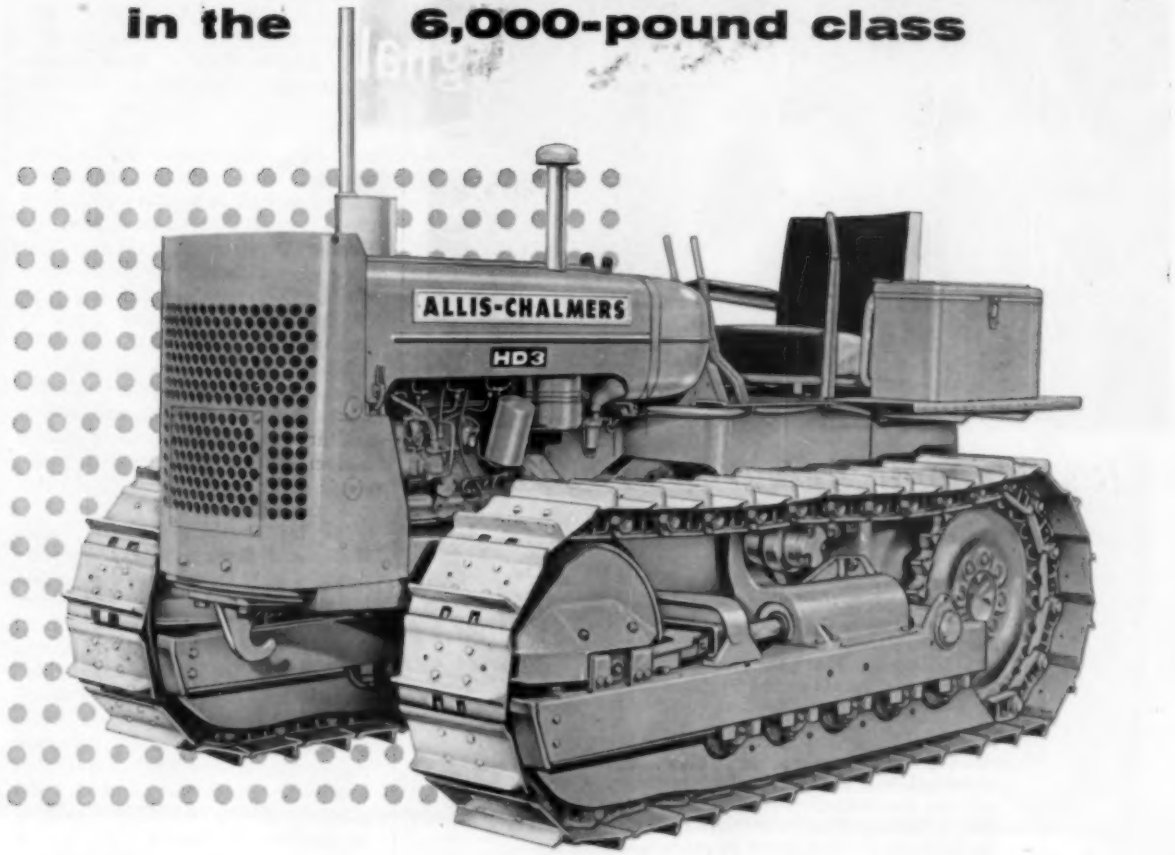
EASTERN INDUSTRIES, INC. • NORWALK, CONNECTICUT

new

H-3 GASOLINE-POWERED

HD-3 DIESEL-POWERED

TOUGHEST COMPACT CRAWLER in the 6,000-pound class



Allis-Chalmers now gives you the toughest compact crawler tractor in the 6,000-pound class—backed by more than 30 years of experience in crawler tractor manufacturing!

Your choice of fuel—gasoline or diesel. The H-3 has the famous 4-cylinder, 43-hp POWER-CRATER engine. The HD-3 diesel is the 4-cylinder, 40-hp engine with follow-through combustion.

Solid, box-type, all-steel main frame securely cradles engine and power train—assures alignment of tractor components and mounted equipment.

Rugged track assembly proved through the years on other Allis-Chalmers crawlers. Heat-treated shoes; long, solid truck frame; large cast steel drive sprockets; heavy-duty forged truck wheels with full 2-inch-diameter shaft carry weight evenly (shown with 5 truck wheels, four are standard).

Independent steering clutches and brakes assure positive maneuvering and minimum maintenance.

Choice of big-capacity "live" hydraulic systems provides instant control of equipment whether mounted on the front, rear, or combination of front and rear of the tractor.

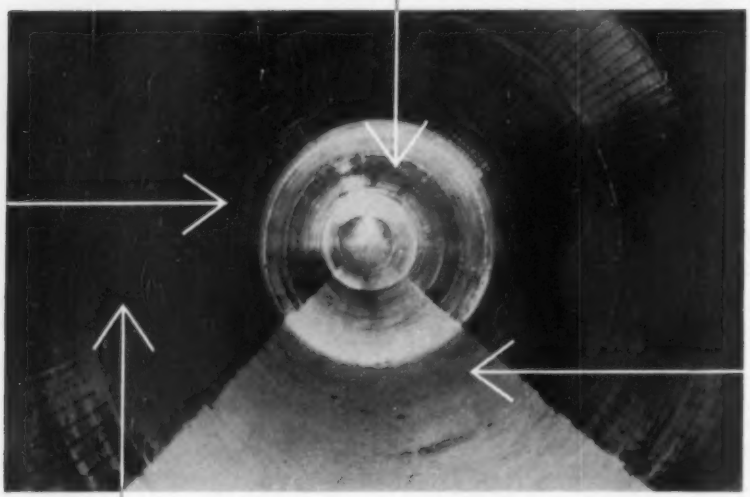
SHUTTLE clutch—standard equipment—gives fast, smooth direction reversing—speeds equal in forward and reverse in any given gear.

See the full line of matched companion equipment for the new *compact* H-3 and HD-3! Talk to your Allis-Chalmers dealer today, or write Allis-Chalmers Mfg. Co., Utility Crawlers, Milwaukee 1, Wisconsin!

POWER-CRATER is an Allis-Chalmers trademark.

ALLIS-CHALMERS

take a
LONG LOOK
at
sewer linings



It's a Hundred Year Proposition

This 9½-foot outfall sewer extends eight miles, and it will go a long way in years of trouble-free service. The engineers who designed it say that it will still be functioning perfectly well into the 21st Century. One important reason is that every surface above the low flow line is completely covered by a continuous membrane of T-Lock Amer-Plate, the vinyl lining that is impervious to chemical effluents and to the corrosive action of oxidized hydrogen sulfide at any level of concentration.

Engineers know that no one can accurately predict future rates of H_2S gas generation, so they have insured the ultimate life of the concrete by investing an extra 8 to 10% for the absolute protection afforded by T-Lock. They predict that this will spare their city the cost of a replacement sewer in about 20 years, and save the taxpayers millions of dollars!

Where protection is required, only T-Lock is satisfactory because only T-Lock combines complete chemical imperviousness with integral T-ribbed back which mechanically locks into the concrete. Experienced sewer design engineers will not gamble on compromise methods. Millions of square feet of T-Lock are now in use in Los Angeles; Topeka; Wichita; Sioux City; Shreveport; Washington, D.C.; San Diego; Mansfield, Ohio; Huntington, W. Va.; Hutchinson, Kansas; and Orange County, Calif. T-Lock Amer-Plate is also on current specifications for many other municipalities. For complete list of users and specifiers, plus technical data and a typical specification, write:

Amercoat CORPORATION

Dept. BN, 4809 Firestone Blvd.
South Gate, California

921 Pitner Ave. Evanston, Ill.
360 Carnegie Ave. Kenilworth, N.J.
111 Colgate Buffalo, N.Y.
2404 Dennis St. Jacksonville, Fla.
6530 Supply Row Houston, Tex.

Gus Ralph Herzik, Jr., after 22 years' service in the Texas State Department of Health, was appointed in 1959 as Chief of Environmental Sanitation Services for that Department. This is a newly created multi-division unit, including food and drug, occupational health, bedding and water pollution control divisions as well as sanitary engineering. Throughout his career with the Health Department, his role has been almost entirely administrative. He handled capably those details as chief of Vic Ehlers' able corps of assistants for 20 years.

Mr. Herzik has two master's degrees, one in civil engineering from Texas A. & M. College and one in sanitary engineering from Harvard University. He also holds a bachelor's and a professional (C.E.) degree from Texas A. & M.

He is Secretary of the Texas Water and Sewage Works Association, which sponsors the well-known short school for operators; the forty-third session will be held this year March 12 to 17 at Texas A. & M. College. His memberships include a number of national societies. He has been elected to Delta Omega and Tau Beta Pi, honorary public health and engineering fraternities, respectively, and is a diplomate of the American Academy of Sanitary Engineers.

He was an officer in the Sanitary Corps in World War II; his assignments included the South American theater, where he did an outstanding job, and the Surgeon General's office. Though true to his old school ties, he married a former student of the University of Texas and built his home in Austin on a hill overlooking the Texas football stadium. He has a son, 20, attending Rice University as an engineering student; his daughter is 12 and probably will not be an Aggie, either. His hobbies are woodworking and music.

His work in organizing an amateur orchestra among attendants at the annual operators' short schools has become a popular highlight of that affair.

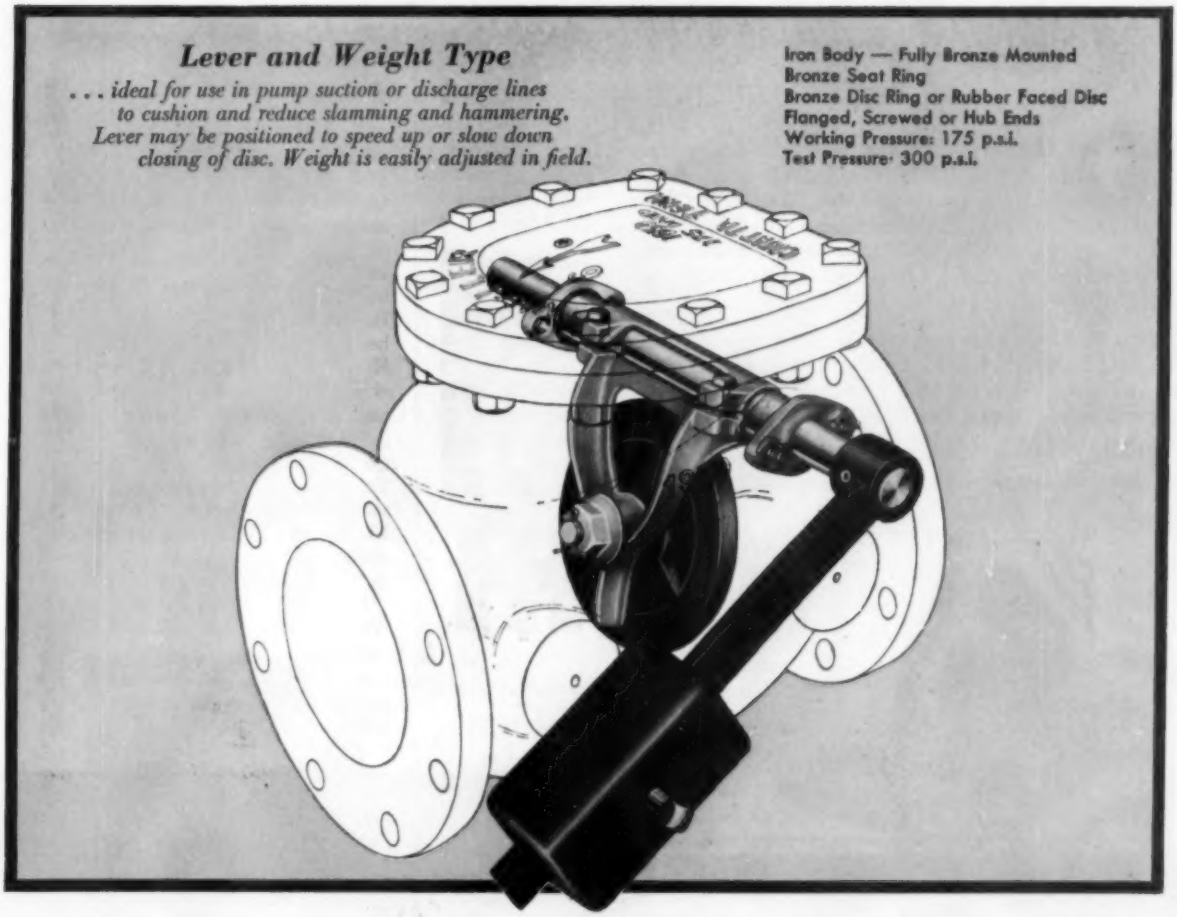
MUELLER® Check Valves

heavy duty disc assembly that lasts and lasts!

Lever and Weight Type

. . . ideal for use in pump suction or discharge lines to cushion and reduce slamming and hammering. Lever may be positioned to speed up or slow down closing of disc. Weight is easily adjusted in field.

Iron Body — Fully Bronze Mounted
Bronze Seat Ring
Bronze Disc Ring or Rubber Faced Disc
Flanged, Screwed or Hub Ends
Working Pressure: 175 p.s.i.
Test Pressure: 300 p.s.i.



All working parts of these new Mueller Swing Type Check Valves are heavily made to assure long service life and dependable operation *without maintenance.*

A heavy stainless steel hinge pin is used on all lever and weight type (shown) and lever and spring type check valves. This pin is extended through the hinge plugs to permit the lever to be used on either side of the body. An "O" ring on the plug prevents leakage around the pin.

The plain type, without lever, weight or spring, uses a new combined hinge pin and plug which is securely and accurately held to the body by studs and nuts. An "O" ring positively seals the plug to prevent leakage.

Large, wear-resistant bearings and a full-width clapper arm hinge, used in all types, accurately and rigidly align the disc to eliminate chatter and vibration.

These new, heavy duty check valves have been specifically designed for repeated opening and closing applications in water works pumping stations, water filtration plants, sewage treatment plants and general industrial plants. They are suitable for horizontal or vertical installation on water or oil lines.

Write for specifications.

The many exclusive features of these new check valves are typical of the attention to detail in research, design and engineering that becomes a part of every Mueller product.

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles; In Canada: Mueller, Limited, Sarnia, Ontario

4424

Emergency standby power boosts water pressure, cuts fire loss!

Dependable International engine doubles gpm to fight crucial fire in business district of Bishop, California

High in the Sierra Mountains, adequate water for the City of Bishop, Calif. is provided by an electric motor pumping 1,250 gpm from a deep well. A 10,000-gallon pressure tank and a million-gallon reservoir above the city provide the reserve supply. For emergencies, the city's 385-hp International UDT-817 immediately doubles the water flow to 2,500 gpm.

"When the hotel burned out in the center of our business district that big International engine greatly increased the pressure and volume of water," says Water Commissioner Lewis Bulpitt. "Firemen hooked their hoses directly onto the hydrants and flooded the burning building to contain the blaze. In another emergency, a roaring fire at the stockyards was brought under control in the same manner. This engine backs us up with water pressure for any emergency."

Emergencies are handled as routine matters when you have reliable, low-cost International engines on standby service. Power for any municipal application—generators, pumps, construction machinery, auxiliary units, etc.—is as close as your nearby International Engine Distributor or Dealer. He'll give you complete information and installation assistance on 35 models from 16.8 to 385 max. hp. Call him soon.

INTERNATIONAL®
ENGINES

International Harvester Co.,
180 North Michigan Ave., Chicago 1, Ill.
A COMPLETE POWER PACKAGE

Modern Versatility...

THREE-WAY USE OF ELLIPTICAL PIPE BY AMERICAN-MARIETTA

1. LO-HED PIPE carries a greater flow than its round equivalent—in a shallower trench with adequate depth of cover.

2. HI-HED PIPE is inherently stronger than its round pipe equivalent for use under extremely high fill. Makes full use of available cross-room without disturbing existing facilities.

Another example of

PROGRESS IN CONCRETE

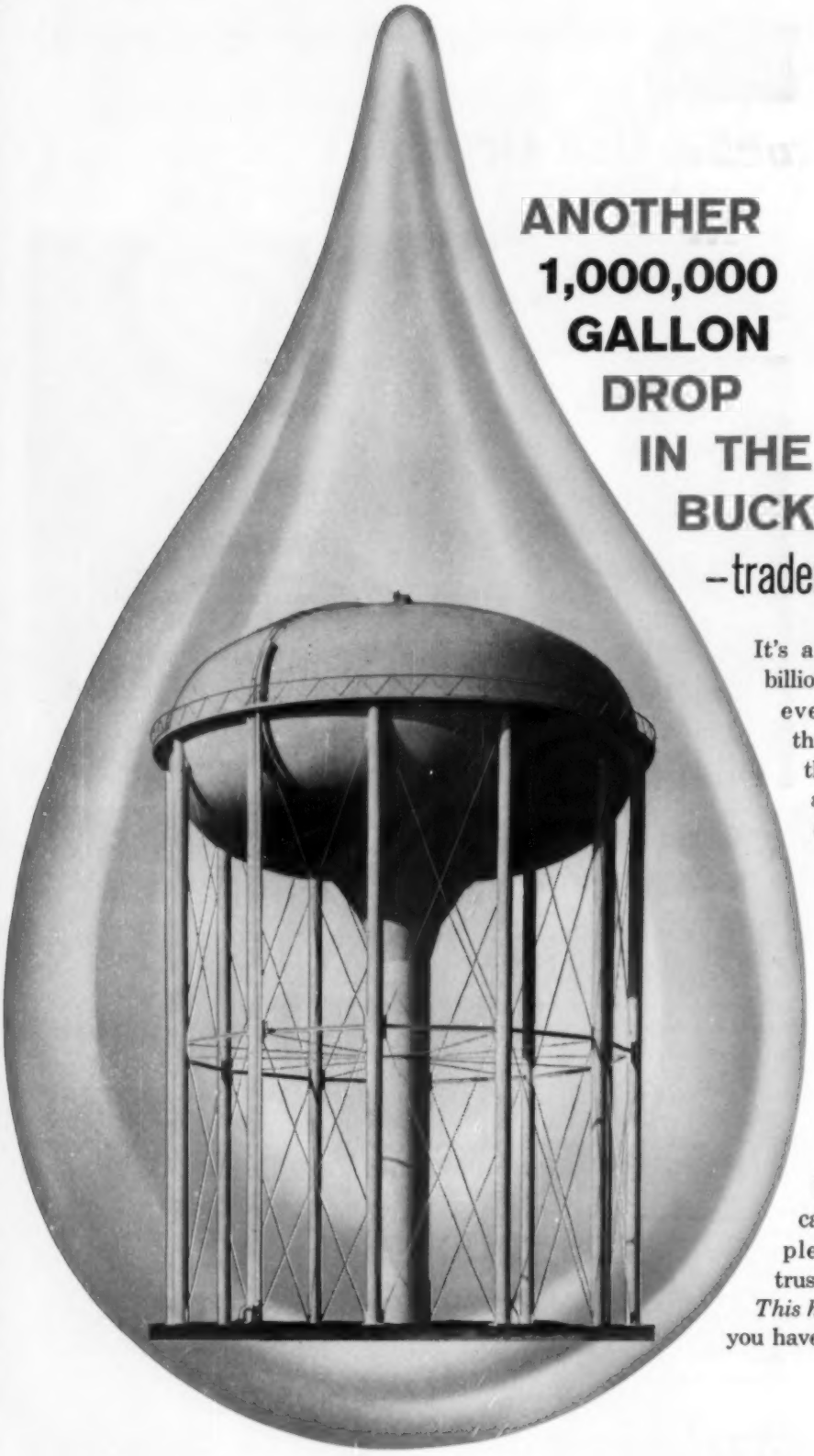
A-M's elliptical concrete pipe was chosen for this combination sewer project because of its increased self-cleansing velocities at periods of dry-weather flow—and used in three ways on this single job . . . as Lo-Hed, Hi-Hed and Inner Circles Pipe. The two mile line, engineered by Consoer Townsend & Associates, Chicago, runs from the Teletype Corporation in Niles, Illinois, to the north branch of the Chicago River.

American-Marietta's reinforced elliptical, as well as round, pipe is available in a full range of sizes with pretested strengths to meet various specifications—can be delivered in quantity when and where needed from any of A-M's many plants located from coast to coast.

Our technical staff will be pleased to assist you with your pipe problems

3. INNER CIRCLES PIPE allows passing of pipe through pipe underground without requiring excavations or disruption of surface traffic. Permits faster work at less cost in any weather.

AMERICAN-MARIETTA COMPANY
CONCRETE PRODUCTS DIVISION
GENERAL OFFICES:
AMERICAN-MARIETTA BUILDING
101 EAST ONTARIO STREET, CHICAGO 11, ILLINOIS, PHONE: WHITEHALL 4-5607



ANOTHER 1,000,000 GALLON DROP IN THE BUCKET

–trademarked PDM ELEVATED STEEL TANKS

It's a mighty big "bucket"—the billions of gallons of water stored every day in PDM tanks throughout the country. So big that the frequent addition of a million or more new gallons of capacity is—comparatively—but a waterdrop in the total. • And yet, to each of the thousands of American communities served by PDM Elevated Tanks, every gallon of the safe and dependable water storage enjoyed is a thoroughly essential part of daily living. • It follows that each PDM tank we build is engineered, fabricated and erected with complete responsibility to the trust it is destined to receive. *This has been so since 1897.* • Do you have our latest Catalog?

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In KNOXVILLE, TENNESSEE

TYLOX Rubber GASKETS, REXON Rubber GASKETS, and REXON PIPE COATING

PREVENT JOINT LEAKS, WHIP ACID ATTACK AND SPEED PIPE LAYING ON STORM-SANITARY SEWER PROJECT

Engineers and city officials went "Hamilton Kent" all the way, in the matter of selecting *leak-proof* pipe joints and *acid-resistant* pipe coating to protect Knoxville's new Riverfront-Willow Avenue sewerage and drainage project . . .

Heavy duty precision TYLOX Gaskets coupled the large diameter T & G concrete storm lines. REXON "K" Light Duty Gaskets jointed the smaller diameter B & S sewer lines, and tough, non-deteriorating REXON No. 2 Pipe Coating put a protective covering inside all lines that would serve nearby stockyards, butchering plants and other industrial installations.

In specifying Hamilton Kent TYLOX and REXON *rubber* Gaskets, and REXON Pipe Coating, engineers and city officials not only provided to the utmost for the safety and long life of the system, but made possible substantial savings in construction costs . . . Both TYLOX and REXON Gaskets are quickly assembled to pipe, and permit fast assembly of the line. Their flexible, *compression* seal compensates for pipe angularities, allows wet trench coupling, and immediate backfilling.

- **WRITE FOR BROCHURES** describing and illustrating use of Hamilton Kent TYLOX and REXON Gaskets and REXON Pipe Coating. Specify these products to protect your pipe projects from leakage and acid attack.

PROJECT: For City of Knoxville, Tenn., Riverfront-Willow Ave. storm and sanitary sewers.

ENGINEERS: H. R. Neal, City Engineer, and Roy I. Gentry, Service Director.

CONTRACTORS: Division A—Harrison Construction Company, Alcoa, Tenn. Division B—Blant Brothers Construction Company, Montgomery, Ala.

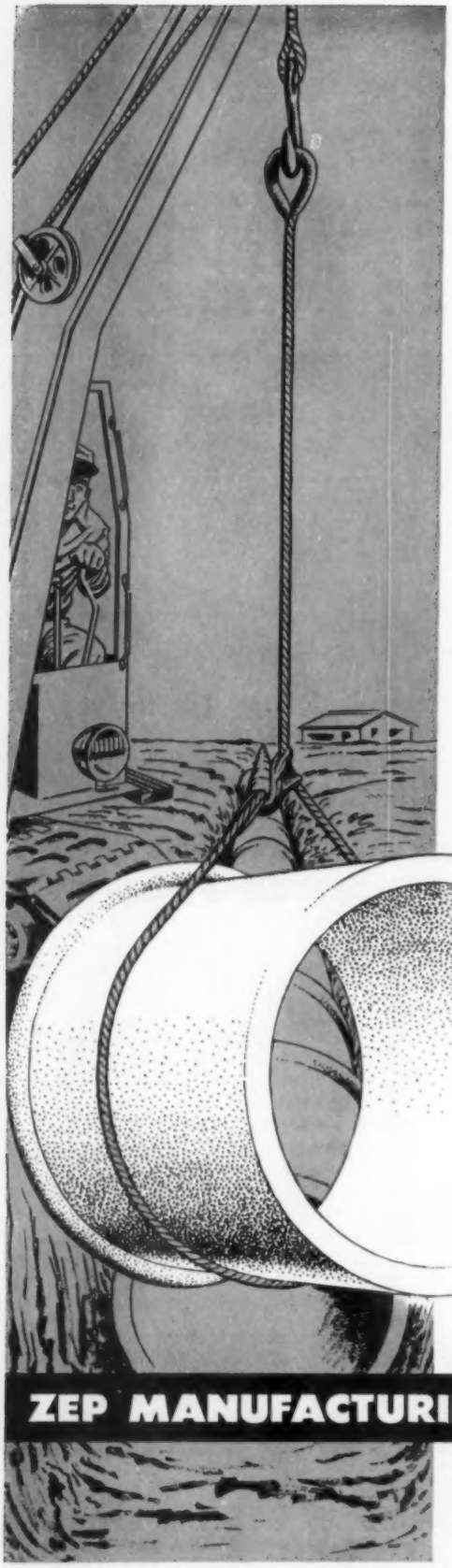
PIPE: T & G and B & S Concrete Pipe, manufactured by Sherman Concrete Pipe Company, Knoxville, Tenn.

5089

HAMILTON KENT MANUFACTURING COMPANY

KENT, OHIO

427 West Grant Street Orchard 3-9555



bury it, but don't forget it

Once sewer pipe is in the ground, you don't want to dig it up again.

The best way to avoid that expensive problem is to positively prevent blockage. A simple maintenance expedient will always keep your sewer lines open . . . regular use of ZEP SEWER AID. This powerful compound will quickly clear sewer lines of ANY alkali-soluble obstruction . . . accumulated debris, grease encrustations, industrial waste, and even tough tree roots.

In emergencies, fast acting Zep Sewer Aid will clear the line from end to end with little time and labor cost, and NO investment in mechanical equipment. It is harmless to the sewer pipe itself, even when used for prolonged periods. In fact, it's a good maintenance buy that solves your sewer clearing problems *when* or *before* they arrive.

Zep Maintenance Experts cover the country. If you want to talk to one, drop us a line, or just write for information and you'll have it by return mail.

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NOW! More jobs are low-cost jobs with New John Deere 1010 *Wheelpower*

Now ready to roll onto your building or earthmoving jobs, new John Deere Wheel Units are powered right, priced right for economical work.

New "1010" Wheelpower is engineered for all-around service, designed as the low-cost answer to earthmoving, material handling, landscaping and utility work. New 40 h.p. four-cylinder gasoline and Diesel engines operate efficiently through the full throttle range for top performance on any job. Deere equipment, including loaders, backhoes, rear blades, landscape tools and mowers provides full versatility.

The John Deere "1010" Wheel Loader is a compact, fast-handling unit well suited to general building work. Five forward speeds and power steering insure easy handling, full maneuverability. Turning radius is only 8 feet 8 inches.

Your John Deere dealer will be glad to demonstrate and give you the information you need on John Deere's "New Generation of Power." He's ready to explain the advantages of the John Deere Credit Plan and long-term leasing, too. Contact him through the classified telephone directory or write today to John Deere, 3300 River Drive, Moline, Illinois.

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BACKHOE

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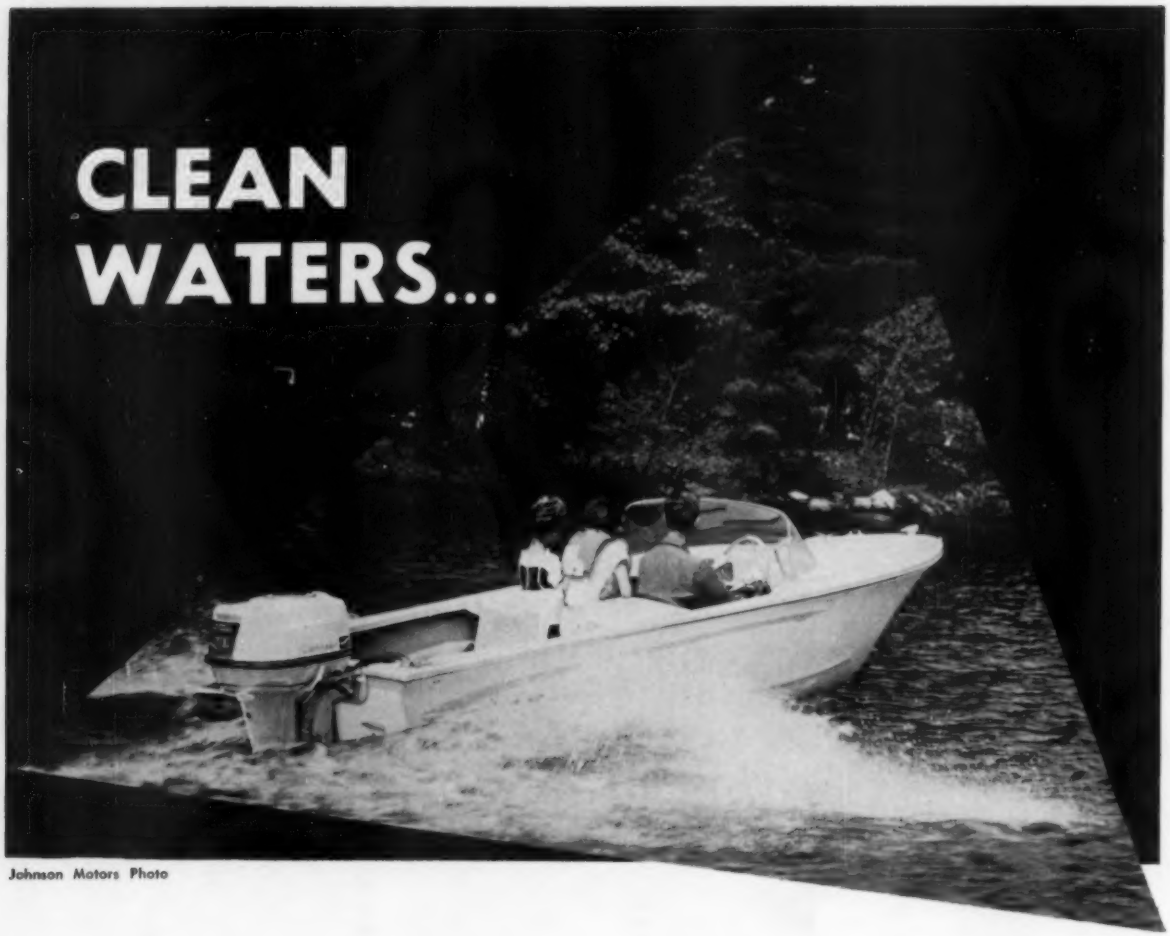
EARTHMOVING

EQUIPMENT



Johnson Motors Photo

are good business

New industries, bigger payrolls, larger property and taxable values follow the clean-up of pollution in local waters. Boating, fishing and bathing become added sources of important spending that funnels new money into far-sighted communities that realize first that clean waters are no longer merely desirable — they are *necessary* to prestige, prosperity and health.

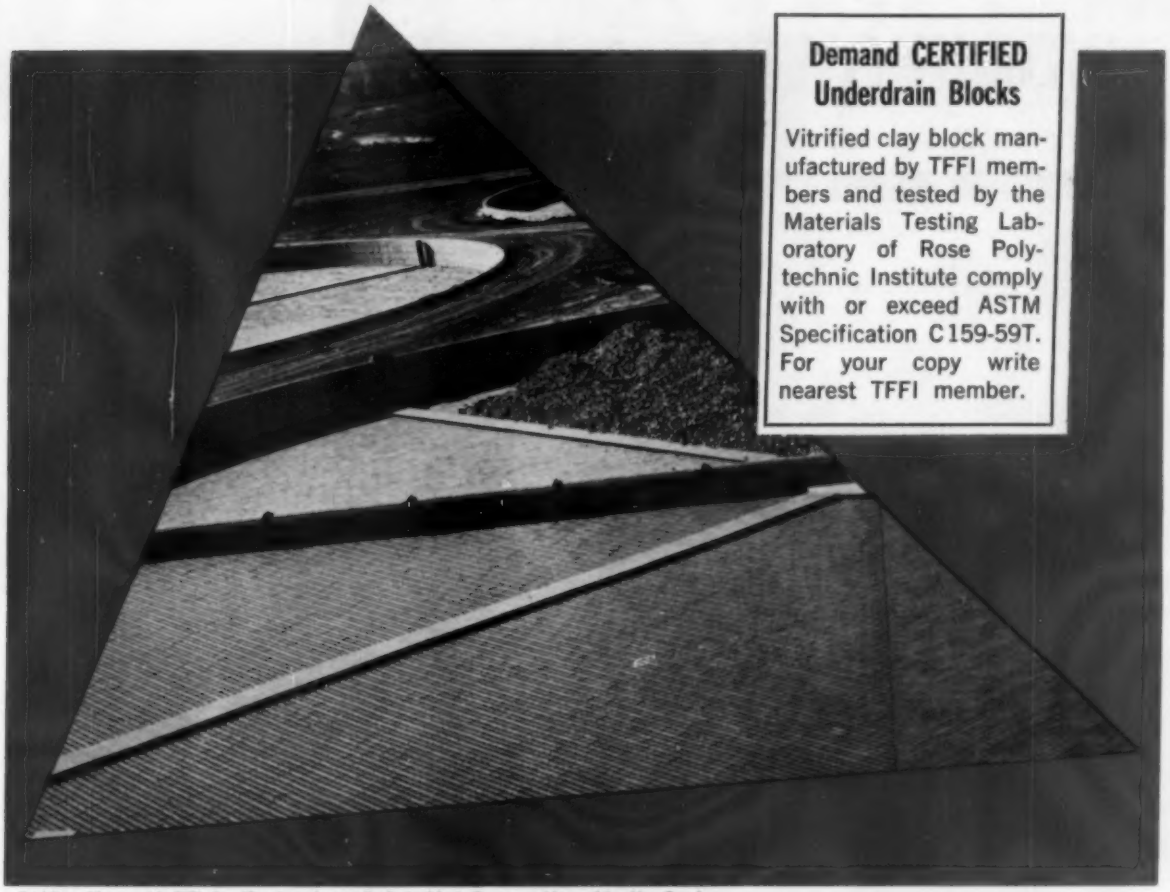
Trickling Filters: first step to clean waters

TFFI

Engineers designing new sewage and industrial wastes treatment works will gain useful data and specifications-suggestions from the 1959 Trickling Filter Floor Institute Handbook. It also indicates the economy, efficiency and ease of future expansion inherent in this type of plant. If you lack a copy just ask your nearest TFFI member for one; without obligation, of course.

Why TFFI Specification Underdrains Excel

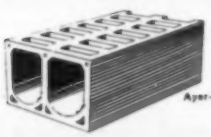
Made of vitrified clay, the best known material for resisting the ravages of acids, alkalis and bacteriological action, they insure long, satisfactory service. They protect against possibilities of costly future trouble in tearing up filter floors to replace deteriorated substitute materials. Rigid quality controls in manufacture that cannot even be approached by substitutes, plus a 50-Year Guarantee that only clay can offer, are your assurance that in the years ahead the *first* cost of TFFI clay floors will be the *only* cost.



Demand CERTIFIED Underdrain Blocks

Vitrified clay block manufactured by TFFI members and tested by the Materials Testing Laboratory of Rose Polytechnic Institute comply with or exceed ASTM Specification C159-59T. For your copy write nearest TFFI member.

Trickling filters with TFFI Specification clay underdrain block floors at Alexandria, Va. Greeley & Hansen, Consulting Engineers; James McHugh Construction Company, General Contractors.



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W. S. Dickey Clay Mfg. Co
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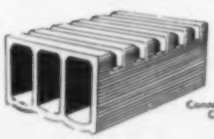
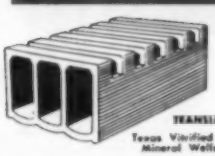
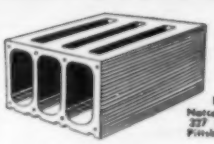


TRANSLOT
Connelton Sewer Pipe Co.
Connelton, Indiana

Trickling Filter Floor Institute



TRANSLOT
Texas Vitrified Pipe Co.
Mineral Wells, Texas



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Natco Corporation
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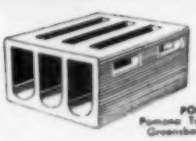
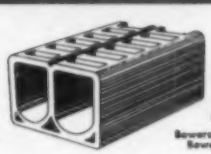
Pittsburgh 22, Pa.



POMONA
Pomona Terra Cotta Co.
Greensboro, No. Car.



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Beaverston Shale Co.
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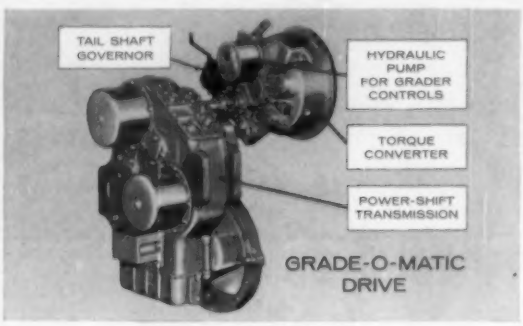
You're miles ahead in performance with GALION GRADERS on the job. They're built to put more WORKPOWER at the blade

HUSKIEST GRADERS BUILT. You get strength to spare from Galion's extra-rugged frame. It's engineered for low-maintenance operation . . . for extra years of cost-cutting performance.

MORE "PUSH-POWER." Full working capacity results from the careful weight-to-horsepower balance built into Galion graders. You get more "push-power" at the blade. That's where power counts most.

EXCLUSIVE GALION DESIGN teams up with heavy-duty engine, rugged transmission, power-booster steering and centralized controls to speed operation. Result is a bigger day's work with less fatigue.



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TORQUE IS MULTIPLIED automatically. Meets varying power needs without constant shifting. Grade-O-Matic operators are free to concentrate on more efficient blade work on every job.

For information on graders from 58 to 220 hp., and weighing up to 42,000 lbs., contact your Galion distributor or write for latest catalog data. The Galion Iron Works & Mfg. Company, U.S.A.

THE GALION IRON WORKS & MFG. COMPANY, GALION, OHIO, U.S.A.

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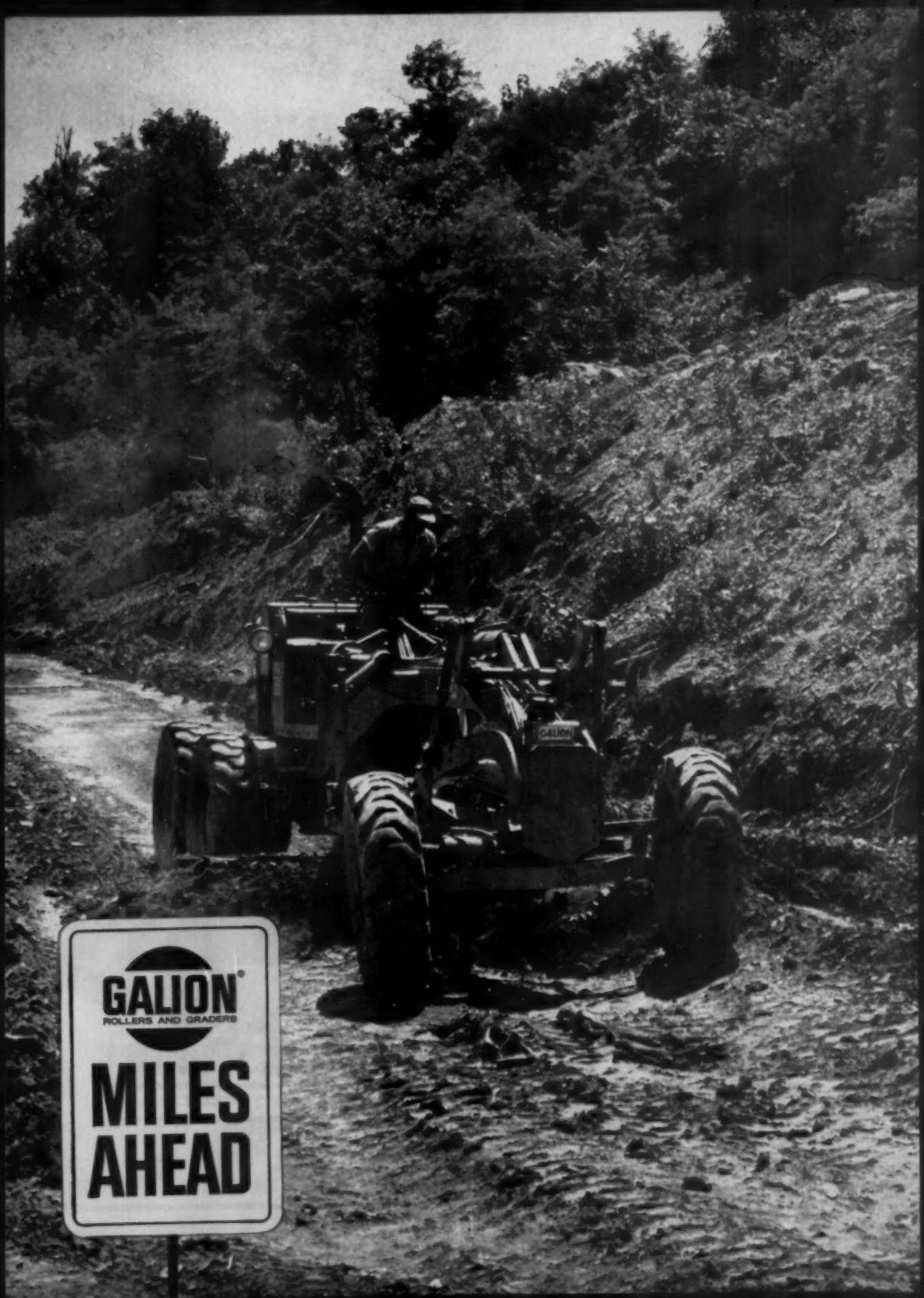
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"Ah'm trainin' Oncle Rafe to swim under water... he wants to get a closer look at them boltless joints!"

U.S. cast iron PIPE FOR WATER, SEWERAGE AND

another "first" from U.S. Pipe

Again, U.S. Pipe takes the lead . . .

This time with the new USIFLEX® Boltless Flexible Joint Pipe, specifically designed to cut costs, save installation time and labor on costly underwater jobs.

Developed after years of research . . . and exhaustive tests . . . Usiflex pipe takes to water like a duck. Marvelously simple to install. No bolts, nuts, wrenches. Self-sealing gasket and lead lock your only accessories. And Usiflex locks bottle-tight with only moderate thrust. Once locked, it stays locked . . . cannot be dislodged when assembled or deflected.

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U.S. PIPE AND FOUNDRY COMPANY
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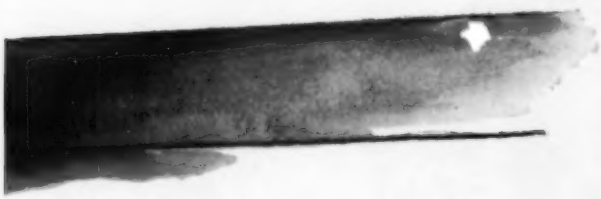
A Wholly Integrated Producer from Mines and Blast Furnaces to Finished Pipe.



USIFLEX®
BOLTLESS FLEXIBLE JOINT* PIPE

*U. S. Patent No. 2,564,938

INDUSTRIAL SERVICE CAST IRON

1 Insert the gasket in its seat in the socket. Forming gasket loop helps initial stage of seating. Release of loop allows gasket to spring into the gasket seat where it is securely held.

2 Apply special Usiflex lubricant to the ball and inside surface of seated gasket in socket. After lubrication, ball is ready to be pushed into socket.

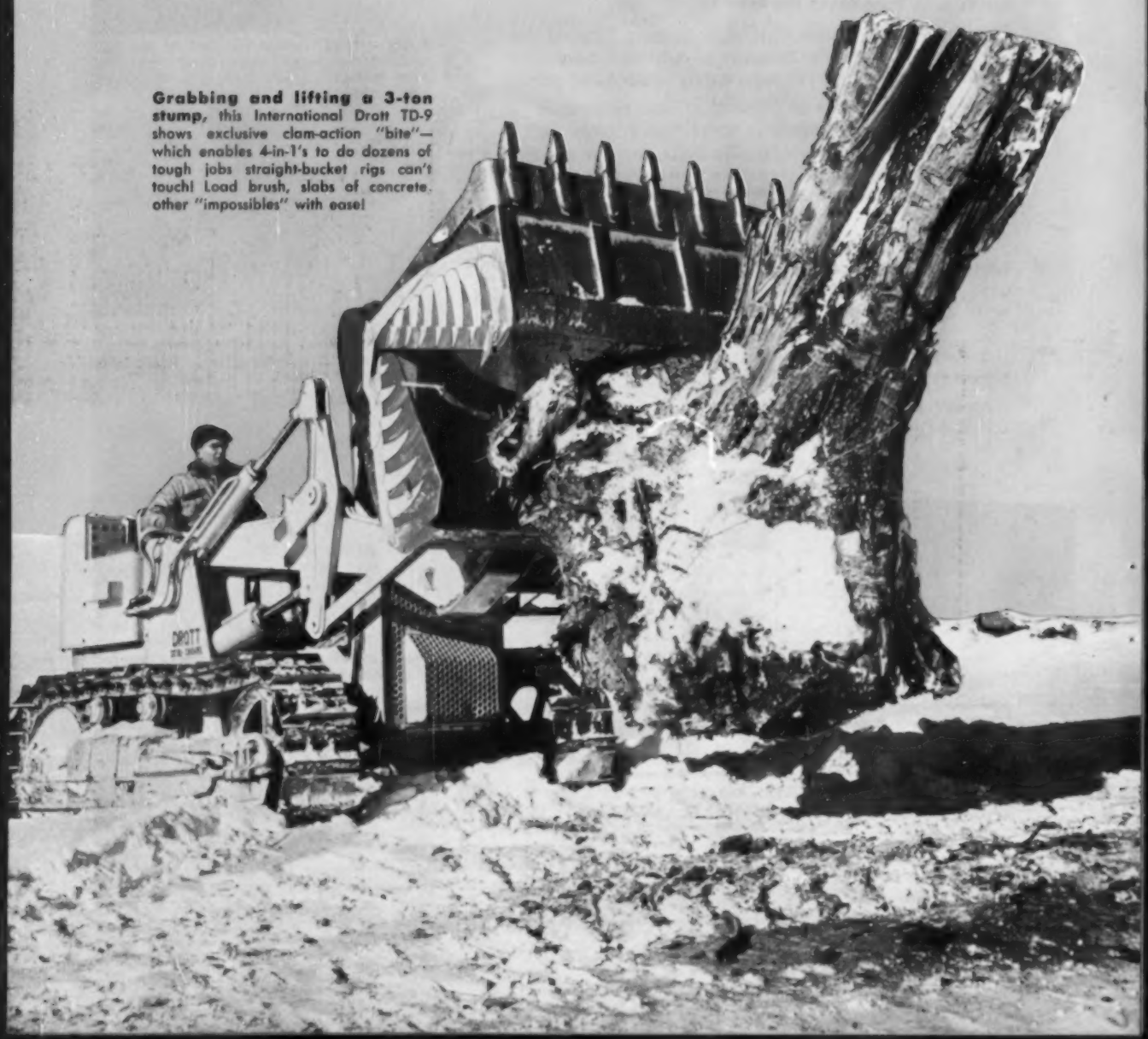
3 Ball has been socketed. Retainer ring lugs have been lined up with recesses in bell and retainer ring is ready to be moved into the bell and rotated.

4 After insertion and rotation of retainer ring in bell, the lugs on retainer ring are in back of and in register with internal flange segments in bell. Lead lock is partially inserted into recess between the bell and retainer ring.

5 Lead lock completely inserted in recess is being caulked in place by hammer blows on a wide caulking iron.

Choose the "bucket with the bite..."
an exclusive clam-action 4-in-1... and

Your City Gets A Whole Equipment Spread of Job-speeding Actions!



Grabbing and lifting a 3-ton stump, this International Drott TD-9 shows exclusive clam-action "bite"—which enables 4-in-1's to do dozens of tough jobs straight-bucket rigs can't touch! Load brush, slabs of concrete, other "impossibles" with ease!

"Dragonized" to dramatize "the bucket with the bite," the stump-toting International Drott TD-9 Four-in-One demonstrates one of the many exclusive *plus-actions* the exclusive clam-action delivers!

Move the hydraulic selector lever and quick as a wink you also get full-capacity, full-range depth-controlled bulldozer action. Two seconds later, you can be grading, stripping, or spreading materials, "carry-type scraper" fashion, with inch-close accuracy. Next instant, the 4-in-1 can be positively bottom-dumping sticky materials that stop other rigs "in their tracks." Then, like a flash it can be back-dragging to grade, pick up, or pull down materials. Or "clamming-on" to heavy, unwieldly "impossibles" like stumps and loading them wholesale!

In addition, the 4-in-1 gives you the top excavator-loader performance on the market—including certified break-out forces ranging from 11,200 lbs with the T-340 to 43,150 lbs with the TD-20! And only the clam-action 4-in-1 has the performance-protection of exclusive shock-swallowing Hydro-Spring.

See for yourself how many "machines" the only modern loader is—how many thousands of dollars of "budget relief" a 4-in-1 can deliver your city. Prove you get a whole spread of work-speeding actions—that obsolete "single-action" loaders, and double for a yard-full of limited-duty rigs! Let your International Drott Distributor demonstrate!

See how "the bucket with the bite" delivers sanitary landfill efficiency no other outfit even approaches. The clam-action 4-in-1 can spread, level, cover, and compact refuse to guarantee minimum-cost sanitary landfill waste disposal. Here, the TD-9 Four-in-One as "carry-type scraper" is evenly covering on-the-go, refuse it had "layered" and "ironed down."

Another "biting action" as "carry-type scraper"—this TD-15 Four-in-One is grading a street with inch-close accuracy. Watch the earth "boil" in! You can strip and spread materials with this same versatile action!

End the sticky materials problem for good with 4-in-1 clam-action—even where other loaders are helpless. Note how opening the clam of this TD-15 Four-in-One pulls material from bucket surfaces—gravity pull does the rest, to enforce clean dumping!

With the clam up and the blade segment in position, "the bucket with the bite" doubles for a full-size, full capacity bulldozer—'most anywhere. This TD-9 Four-in-One is grading for sidewalks in a new subdivision.

International Harvester Company, Chicago 1, Illinois
Drott Manufacturing Corp., Milwaukee 15, Wisconsin

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NEW LISTINGS

Get Acquainted With This New Loader-Tractor-Backhoe

388. A completely integrated loader-tractor-backhoe, the Dynahoe, is briefly yet fully described in an attractive new catalog which includes listings of special features, specifications and dimensions. Write for "Dynahoe Brochure" to the Hy-Dynamic Co., Lake Bluff, Ill., or use the inquiry card.

One Unit; Four Different Machines

392. Operators of the International Drott 4-in-1 Skid Shovel have four different machines at their fingertips, ready for use as a bulldozer, scraper, skid-shovel and clamshell. To review these varied services and many exclusive features get Bulletin CR-600-I. Use the reply card or write International Harvester Co., 180 N. Michigan Avenue, Chicago 1, Illinois.

Users of Transite Pressure Pipe

403. . . . will welcome a new, revised edition of the "Installation Guide for Transite Pressure Pipe," just published. Covers all operations from trench-side to final assembly, service connections, backfilling, tamping and testing. Order your copy of 124-page TR-62A from Johns-Manville, 22 East 40th St., New York 16, N. Y., or check our card.

Put a "Magic Eye" In Your Sewers

405. To tell you by closed-circuit television where breaks, leaks, infiltration may be. The Inspectoline Television System enables you to see just where trouble is or may start . . . in lines as small as 6-inch. For full data address Inspectoline Inc., 9501 Euclid Ave., Cleveland 6, Ohio, or check our card-number.

Descriptive Folder on the Altite Joint Cast Iron Pipe

410. Contains general description of this Underwriters' approved and patented slip-on joint of the single rubber ring gasket type. Write for your copy to Alabama Pipe Co., Anniston, Ala., or check the number on our card.

Put a "Supervisor" in Every Truck Cab

413. Interesting booklet tells how you can monitor your drivers—even in off-the-road highway equipment—with equipment that pays for itself by recording lost-time operations that run up your costs. Helps drivers correct bad driving practices. Get this brochure from Automotive Div., Wagner Electric Corp., 6400 Plymouth Ave., St. Louis 14, Mo., or check our card-number.

The engineering information in these helpful catalogs will aid you in your Engineering and Public Works programs. Just circle numbers you want on the reply card, sign and mail. This free Readers' Service is restricted to those actively engaged in the public works field of cities, counties or states.

Do You Know All the Advantages of Aluminum Culverts?

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New Way to Clear Clogged Sewers

415. . . . is described in a circular telling what happens when ZEP Sewer Aid is introduced into sewers and industrial wastes drain lines. Claimed that not even tree roots can resist it. Inform yourself with this "Report 20," to be had from Zep Mfg. Corp., P. O. Box 2015, Atlanta 1, Ga., or just circle our card-number.

Spot Trouble in Your Sewers with TV

427. A new, proven closed circuit TV system that can be operated by semi-skilled technicians is described in a new brochure offered by Eye Tronic, Inc., Ainsley Bldg., Miami 32, Fla. Check our card-number for your copy.

New Curb Valve

433. The Mueller Oriseal valve works equally well once a season or once a Century! What it is and why it does so well is fully described in full-color folder 9010. For your copy write Mueller Co., 512 W. Cerro Gordo, Decatur, Ill., or ring number on this card.

Readers' Service Index

New Catalogs ....pages 34 & 36
Lighting & Traffic .....page 36
Business .....page 36
Construction .....page 38
Sewerage & Waste .....page 40
Street & Highways .....page 41
Water Works .....pages 44 & 46
Refuse .....page 48
Snow & Ice .....page 48
Weed Control .....page 48

Manual Answers Your Water Meter Questions

440. This valuable reference covers the complete line of Trident water meters, giving full descriptions of each type and providing also helpful background information on metering and its advantages. Get your copy of the 28-page Trident Water Meter Catalog, Form 421-1, by checking the reply card or write to Neptune Meter Co., 19 West 50th St., New York 20, N. Y.

New Development in Traffic Engineering Aids

445. 4-page folder describes uses and operation of a new highly-accurate infra-red traffic detector for signal controls. To get your copy write Honeywell Industrial Products Group, Heiland Div., 5200 E. Evans Ave., Denver 22, Colo., or check our card.

Features of the Traxcavator

452. Design features of the Caterpillar 922 Series A Traxcavator are covered in a 12-page booklet that tells why this machine is a top producer yet provides greater operator safety and convenience together with ease of maintenance. For your copy write to Caterpillar Tractor Co., Peoria, Ill., for Booklet 34004 or check the inquiry card.

"A Coat in Time Saves Nine"

439. The solution to a wide variety of corrosion and deterioration problems is presented in a new 8-page bulletin on Bitumastic Cold-Applied Protective Coatings. Specifications, properties and applications of 9 major products are covered. Get your copy of Bulletin T-97-61 from Tar Products Div., Koppers Co., Inc., Koppers Bldg., Pittsburgh 19, Pa., by checking the inquiry card.

Usiflex Boltless Flexible Joint Pipe

471. New 8-page booklet describes joint provided with Usiflex pipe. Simple, rugged bottle-tight joint for cast iron pipe which is assembled without use of bolts. Locked against pull-out and offered as ideal for underwater installations. Address U. S. Pipe and Foundry Co., 3300 First Ave., North, Birmingham 2, Ala., or check our card-number.

Valuable Data on Air Pollution Control

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485. Factors to be considered in the selection of elevated steel tanks plus capacities, dimensions and particulars of many attractive designs are provided in 20-page Bulletin 101 of Pittsburgh-Des Moines Steel Co., Neville Island, Pittsburgh 25, Pa. Use inquiry card to get your copy.

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NEW LISTINGS (Cont.)

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711. A comprehensive manual covering nearly all phases of mercury vapor lamps, the new 28-page technical booklet contains the latest information on nearly all phases of mercury lamps including light output, life ratings and electrical and physical characteristics. In addition, it describes lamp construction, designations, color rendition and necessary auxiliary equipment. The manual, called, "Mercury Lamps," may be obtained from local Westinghouse lamp sales offices or by returning the reply card.

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BUSINESS ADMINISTRATION

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The Principles of Compaction by Vibration

288. Compaction specifications that can't be met with ordinary compactors are no problem to the new Essick vibrating rollers. Complete descriptive literature explaining the principles of compaction by vibration and the Essick vibrating roller is available from Essick Mfg. Co., 1950 Santa Fe Ave., Los Angeles, Calif.

Tractors and Equipment for Municipal Use

407. Specification sheets for the John Deere crawler and utility wheel tractors; also equipment for loading, dozing, mowing, sweeping and many other operations. John Deere, Industrial Division, Moline, Ill. Check the reply card. State type of tractor and equipment.

Manual on Structural Shapes

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The Tractors that Put the Utility into Utility Tractors

618. Low profile, high clearance, and a new Shuttle clutch, power steering are a few features. For the full story write Allis-Chalmers Mfg. Co., Milwaukee 1, Wis., for Utility Tractors literature, or circle our card-number.

Color Catalog Describes "Michigan" Tractor Dozers

631. A 20-page catalog on "Michigan" Models 180, 280 and 380 tractor dozers covers the design and operating features and explains how the hydrulic controls regulate all dozer operations. For your copy write to Construction Machinery Div., Clark Equipment Co., P. O. Box 599, Benton Harbor, Mich., or check the reply card.

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Attachments For Ford Tractors

643. Clearing, backfilling, ditching, excavating, mowing, scarifying, sweeping, and trenching equipment are a few of the attachments described in literature from Tractor and Implement Div., Ford Motor Co., 2500 East Maple Road, Birmingham, Mich.

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SEWERAGE AND WASTE TREATMENT

What You Should Know About Trickling Filter Underdrains

20. Specifications for vitrified clay under drain blocks conforming to ASTM standards, suggestions for layouts and construction of trickling filter floors, dimensions of standard blocks, channel covers, angles and other fittings are available from the Trickling Filter Floor Institute c/o Editor, Public Works, 208 So. Broad St., Ridgewood, N. J. Check the reply card and we will forward your request.

Package Plant Provides Big-City Sewage Treatment

41. With a design based on the "Ten State Standards," the Bio-Pac employs two-stage biofilters, primary and secondary settling and sludge digestion, all in a single corrosion protected steel shell. Design criteria for selecting appropriate sizes for residential, industrial plant, restaurant, motel and trailer court and school use are featured in Folder 2971. Also given are dimensions and installation data for 50 to 500 population equivalent plants. Write to Link-Belt Co., Colmar, Penn.

Theory of Controlled Digestion With Floating Cover Tanks

88. In an excellent 40-page booklet, an authoritative discussion of digestion theory and practices, including design, operation and economics is presented by the Pacific Flush Tank Co., Chicago 13, Ill. Complete data are given on the use of floating covers, together with details on tank construction, piping and control chambers.

Protective Lining for Concrete Pipe and Structures

131. T-Lock Amer-Plate is a tough, long-lasting acid-resistant vinyl sheet lining for concrete pipe and structures which are exposed to corrosive materials. T-shaped ribs pressed in the sheet are embedded in the concrete as it is poured to lock the lining permanently in place. Get full details from Amercoat Corp., South Gate, Calif.

The Submersible Pump You have Been Waiting For

141. Electric, fully submersible, portable, runs dry without damage, no priming, and other outstanding advantages. All are described in Flygt Bulletin B-80L of Flygt Corp., Hoosick Falls, N. Y. Address them or just circle the number on our card.

Package Sewage Plants for 50—5000 Population

181. Design information on Walker "Sparjair" package sewage treatment plants for sizes from 50 to 5000 population equivalent is presented in a 12-page bulletin, No. 19-S-94. Typical plans and sections, special design considerations, specifications and a discussion of the "how" and "why" of the contact stabilization process are included. Check the inquiry card or write Walker Process Equipment, Inc., 840 No. Russell, Aurora, Ill.

How to Save $264 per Mile

216. . . . in sewer cleaning is the gist of a new 8-page brochure that discusses just how such savings can be accomplished. It costs nothing to find out and it may be your best investment of the day. Write for it to Flexible, Inc., 3786 Durango Ave., Los Angeles 34, Calif., or circle the card-number herewith.

Select Your Incinerator Scientifically

275. Here is a new swift simple way of selecting the correct industrial, institutional or business-use incinerators for various types of installations. The device is somewhat like a slide rule and takes in the variable factors which determine choices in incinerators. Get yours from Morse Boulger Inc., 80 Fifth Ave., New York 11, N. Y., or check number on our card.

How to Dispose of Sewage and Industrial Sludges

281. Get full information on the C. E. Raymond System of combined incineration and sludge drying providing high temperature deodorizing for nuisance-free sludge disposal. Flexible layouts fit large and small communities. Use handy reply card or write Combustion Engineering Inc., Raymond Div., 427 West Randolph St., Chicago 6, Illinois.

Trenches for Water and Sewer Line Construction

384. Three Cleveland J trenchers incorporating major advances in trencher design and operating advantages are described in Bulletin L-104 available from The Cleveland Trencher Co., 20100 St. Clair Ave., Cleveland 17, Ohio. Check the reply card for digging capacities, specifications and dimensions.

Many Fuels Will Power Enterprise Engines

395. New bulletin tells of economies and advantages of the Enterprise Engine "Dual Fuel" system. Ideal for stationary power plants, sewage treatment plants, and pumping stations. Address Enterprise Engine & Machinery Co., 18th and Florida Sts., San Francisco 10, Calif.

Getting Improved Sludge Dewatering With Non-Clogging Vacuum Filters

425. Latest information on the Komline-Sanderson "Coilfilter," which features non-clogging, permanent filter media to obtain constant output and low operating cost is presented in illustrated Bulletin No. 106 by the Komline-Sanderson Engineering Corp., Peapack, N. J. Be sure to investigate this improved method of sludge dewatering. Check the reply card today.

Sewage Treatment Engineering Data Manual

511. This manual contains a brief outline of the various accepted methods of treating sewage and some of the problems, advantages and disadvantages of each. Check the reply card or write Smith & Loveless, Inc., Division—Union Tank Car Co., Lenexa, Kansas for design notes, charts and drawings.

Use The Reply Card

Putting Small Sewage Treatment Plants in the "Big Time"

557. Four equipment units that get big plant results in small plant operation are featured in an 8-page booklet "Small Plant Sewage Treatment." Drawings and flow sheets give the details. Write Dorr-Oliver Inc., Stamford, Conn. for Bulletin 6692 or use the reply card.

Small Unit Sewage Treatment For 20 to 5000 People

568. Bulletin 135A describes the Rated-Aeration process, a low cost, odorless, trouble-free sewage treatment process. Check the reply card or write Chicago Pump Co., 622 Diversey Parkway, Chicago 14 Ill.

Save Money While Pumping Sewage or Storm Water

616. New line of prefabricated pumping stations hold down on-the-job costs and give new economies. Ideal for municipalities, housing projects, sanitary districts, resorts, shopping centers, etc. Address Zimmer & Francescon, 1715 15th Street Place, Moline, Ill., or circle card-number.

Sludge Removers for Tanks of Any Size or Type

659. The Rex Unitube Tow-Bro Sludge Remover is described as a proven standard of the industry. Bulletin 315-81 shows how Tow Bro can be applied to tanks of any size or type. Write Chain Belt Co., Milwaukee 1, Wis.

Reinforced Concrete Pipe For Culverts and Sewers

672. Elliptical Lo-Hed and Hi-Hed pipes, round pipe and flat base pipe are described fully in literature from American-Marietta Co., Concrete Products Div., 101 East Ontario St., Chicago 11, Ill. Headwall details, discharge curves, hydraulic capacity tables and hydraulic properties are included. Check the reply card.

To order these helpful booklets check the reply card opposite page 34.

STREETS AND HIGHWAYS

How to Get Better Grader Operation

111. A most interesting and instructive 20-page illustrated action booklet on how to operate a motor grader is now available from Galion Iron Works & Mfg. Co., Galion, Ohio. Designed to help operators get more effective use from the versatile motor grader, this booklet covers the hydraulic system, steering, tips on leaning wheels, proper blade positioning, turning, gear speeds and operating procedures. Colorful, easy-to-read presentation guarantees good readership. Check the reply card for your copy.

Chip Dollars from Your Overhead With Fitchburg Chippers

160. Detailed cutaway drawings, specifications, diagrams, charts and money-saving reports and experiences are covered in catalog available from Fitchburg Engineering Corp., Dept. PW, Fitchburg, Mass.

International Wagner Heavy-Duty Loaders and Backhoes

195. International Wagner loaders and backhoes are matched with International utility tractors and are described in Catalog CR-1369-K available from International Harvester Co., Consumer Relations Dept., 180 N. Michigan Ave., Chicago 1, Ill. Check the reply card.

How to Get Better Concrete Bonding

307. Whether your problem is bonding old to old concrete, new or fresh concrete to old concrete, or remedial patching and anti-skid surfacing, there is help in a very new informative booklet on Thiokol liquid polymer epoxy concrete adhesive. Just write Thiokol Chemical Corp., 780 N. Clinton Ave., Trenton 7, N. J.

Gradall Does Too Many Jobs To Classify Them

340. The best way to learn how many places and in how many ways the Gradall earth moving and construction machine can speed work and save money for you is by writing for brochure M-2460. You get it from The Warner & Swasey Co., Const. Equipment Div., 5701 Carnegie Ave., Cleveland 3, Ohio, or by circling above card-number.

Added Loader Attachments Add More Mileage for Your Tax Dollar

383. . . . are the intriguing title and content of this handy 16-page pocket-size booklet listing new equipment and new uses for the PAYLOADER you have or the one you are going to get. Ask for "More Mileage" from the Frank G. Hough Co., Libertyville, Ill.

Use The Reply Card

Everybody Else May Have Automotive Battery Problems—

401. . . . except those who have read the Leece-Neville folders on their alternator-generator systems, and then done something about it. Have less trouble by taking the trouble to write for these bulletins, to The Leece-Neville Co., 1374 East 51st St., Cleveland 3, Ohio, or ring the card-number.

Self-Propelled Ditching Machines

438. Information on a self-propelled one man operated ditching machine, model 524 T, model W-2 and a new midget ditcher, model 4 T, for light construction is now available from the Vermeer Mfg. Co., Pella, Iowa. The Model 524 T digs 8 to 24 inches wide and down to 6 feet deep, while the model 4 T digs 6 to 14 inches wide and down to 4½ feet deep. Model W-2 Ditcher digs from 2" wide up to 4" down to a depth of 30". Full data on these ditchers available by checking the reply card.

Prompt Service on Sweeper Refill Fibers

367. Here's a dependable source of power sweeper refill fibers, including domestic and imported types and gutter broom wire. To get all the data write A. Steiert & Son, Inc., Hatfield, Pa., or use our reply card.

1961 Truck Line Story From Chevrolet

446. The 1961 Chevrolet truck line is described fully in literature from Chevrolet Motor Division, General Motors Corp., General Motors Building, Detroit 2, Michigan. Check the reply card for data on this line of 165 models.

The Trucks You Need for Every Public Works Job

461. Extra life and operating economies are built-in features of every Ford truck model. There's a chassis size and engine for each of your needs, from light utility work to heavy-duty construction jobs. Get latest literature from Ford Motor Co., Truck Div., Dearborn, Mich., by checking the reply card.

Design of Concrete Pavements For City Streets

657. Sections covered in this manual are classes of streets as to traffic, quality of concrete, working stress and safety factor, types of pavement design, design procedure, jointing of municipal pavements and use of distributed steel. Check the reply card or write Portland Cement Association, 33 West Grand Ave., Chicago 10, Ill.

Make Your Concrete Defy the Seasons.

658. A new pocket-size booklet describes and illustrates all the good things Wyandotte Calcium Chloride can do for your concreting in faster hardening, high early strength, increased final strength and workability—to name but a few. Get your copy from Wyandotte Chemicals Corp., Wyandotte, Mich., or circle the number above.

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Small amount of pressure forces end to bottom of socket, completing the tight joint.

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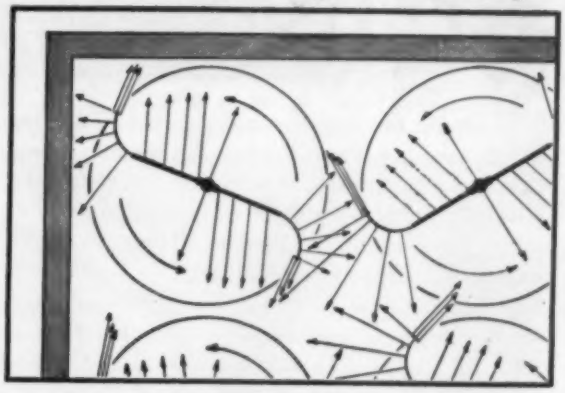

New S-Type Filter Arms double the cleaning action

With new S-Type arm of Agitator shown above each corner and void area receives four (4) agitating impulses per revolution instead of two . . . doubling the cleaning action in those areas. S-Type Arms can also be adapted to older units in service. Ask us for full particulars.

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"We bought our first Sherman in 1953. When business grew, we bought another. From the first day we had them, both Shermans have been in constant use—at any given time we have about 20 jobs in progress—requiring only minimum maintenance to keep them running in equal-to-new condition. By now, our two Shermans have delivered a total of more than 11 years continuous service, amounting to more than 33,000 operating hours, in some of the toughest imaginable situations. They seem to be indestructible... we figure to keep on using Sherman products."

Why not find out what Sherman can do for you? See your Ford dealer... Check the yellow pages or write to Allied Equipment, Ford Motor Company, 2500 E. Maple Rd., Birmingham, Michigan.

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Big and fast, with typical Sherman dependability . . . 12′ digging depth, 188° swing, exclusive filter gauge, much more for high production, low maintenance.

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PRE-EMERGENCE HERBICIDES
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effective control of most broadleaf weeds and grasses.

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FREE BROCHURE: New full color booklet contains complete directions, diagrams, applications and other useful data for both Simazine and Atrazine. Address: Department PW-1

Apply Simazine or Atrazine herbicide once. Get full season weed control on road shoulders, around guard rails, and other places where weeds cut visibility or mar highway appearance. Both Geigy herbicides are available as wettable powder and as granules.

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SOIL engineering is the practical application of engineering principles to problems involving the use of soil, either in its natural condition, or as a construction material. In this authoritative booklet all phases of soil engineering are treated in simple, easily understandable language. Full information is provided on basic soil properties, classification systems, field and laboratory tests, frost action and compaction. Liberally illustrated and containing many special charts and graphs to assist the engineer in his work.

ORDER from Book Department, PUBLIC WORKS, 200 So. Broad St., Ridgewood, N.J. Only $1.00 per copy.

WATER WORKS

Do You Have An Independent Source of Electricity?

27. An independent source of electricity which will supply power for vital services when regular sources fail can be invaluable during emergencies. Check Kohler Bulletin KEP 56-1 which furnishes data that will help you select the plant best suited for your needs. Many models, 500 watt to 100 Kw, portable and stationary are described. Write the Kohler Co., Kohler, Wis., or use the reply card.

How to Select Right Angle Drives

62. Data-filled Catalog 31 of Johnson Gear & Mfg. Co., Ltd., 8th & Parker Sts., Berkeley 10, Calif., makes it easy to select the correct right-angle gear drive for deep well turbine and other vertical shaft pumps. Includes details on the Johnson "Redi-Torq" gear drive. To get your copy just check the reply card.

Easily Cleaned Long Run Filter Bed Media

70. Bulletins on Anthrafilt tell the reasons why selected, graded crushed anthracite is superior to sand as a filtering material. Have you made a full investigation? Write Anthracite Equipment Corp., Wilkes-Barre, Pa.

100 Page Book Helps Solve Water Problems

71. pH and Chlorine Control. A discussion of pH, Chlorine and Phosphate Control and descriptions of comparators for making colorimetric analyses. A 100 page booklet is available by checking reply card. W. A. Taylor & Co., 7304 York Road, Baltimore 4, Md.

Convenient Reference Manual Covers Cast Iron Pipe, Valves and Hydrants

74. An 80-page manual, issued by R. D. Wood Co. Independence Sq., Philadelphia 5, Pa., presents specifications for "Sand-Spun" cast iron pipe and fittings, outlines types of joints available, lists dimensions and weights in convenient tables and includes, in addition, full engineering data on the Mathews and R. D. Wood fire hydrant and R. D. Wood gate valves.

Automatic Engine Control Equipment Manual

83. This catalog contains descriptions of standard automatic and semi-automatic controls and control equipment. General control recommendations, control selection chart, accessory selection chart, safety stop controls and alarm sets are sections covered. For price lists and models available write Synchro-Start Products, Inc., 8151 N. Ridgeway, Skokie, Ill.

Rapid Sand and Pressure Filter Data

109. Rapid sand filters. A complete line of vertical and horizontal pressure filters, wooden gravity filters, and filter tables and other equipment. For engineering data, write Roberts Filter Manufacturing Co., 640 Columbia Ave., Darby, Pa., or check the reply card.

Information on Service, Valve, Roadway and Meter Boxes

122. Literature on specifications covering "Buffalo" service, valve, roadway and meter boxes, and adjustable valve boxes for water and gas has just been released from Buffalo Pipe & Foundry Corp, Box 55-Station B, Buffalo 7, N. Y.. Check the reply card for your information on these valve boxes.

Water and Sewage Plants

147. Engines are four-cycle, 6 or 8 cylinder, in-line models, ranging from 190 to 2150 bhp and from 135 to 1500 KW, are available either naturally aspirated or supercharged, and can be furnished to run as diesel, dual-fuel or gas engines. For Bulletin #115A check the reply card or write White Diesel Engine Div., The White Motor Co., Springfield, Ohio.

AWWA Fire Hydrants and Gate Valves

155. Above-ground maintenance Mueller AWWA improved fire hydrants and minimum maintenance Mueller AWWA non-rising stem gate valves are described in literature from Mueller Co., Decatur, Ill.

A Short Course In Pipe Jointing

169. The story of rubber couplings for clay and concrete pipelines is graphically presented in the booklet "Pipe Enterprise", published by Hamilton Kent Mfg. Co., Kent, Ohio. Detailed description of pipe jointing methods; photos showing jobs where Tylox gaskets met the need for easily assembled permanently tight joints installed under all conditions; and a report on the development, manufacture and outstanding features of the compression type gasket make this booklet valuable to every engineer and contractor. Check the reply card.

A Comprehensive Handbook on Water Meter Settings

174. "The Engineering of Water Meter Settings" contains 34 pages of clearly illustrated data and specifications to help improve your practices and simplify your work. Every Water Department should have a copy of this valuable reference book. To get yours address Ford Meter Box Co., Inc., Wabash, Indiana, or use the inquiry card.

The Design and Function of Elevated Steel Water Tanks

179. A 20-page bulletin of engineering information with illustrations of typical installations, emphasizing ellipsoidal, radial cone and spheroidal designs, may be obtained by writing Chicago Bridge and Iron Co., Advertising Dept., 332 South Michigan Ave., Chicago 4, Ill. or by checking the reply card.

Design of Prestressed Concrete Tanks

194. An 8-page technical Bulletin, T-19, on the Design of Prestressed Concrete Tanks, gives engineering data and formulas of general interest to anyone considering prestressed concrete for storage tanks. Check the reply card or Write to The Preload Co., Inc., 355 Lexington Ave., New York 1, N. Y.

Use The Reply Card

Complete Catalog and Reference Data on Valves and Fittings

211. The entire M & H line of valves, fittings and accessories for water works, filtration, sewage disposal and fire protection are illustrated and fully detailed in Catalog 52 issued by M & H Valve & Fittings Co., Anniston, Ala. In addition to complete data on these products, there are many pages devoted to helpful engineering data. Every designer should have a copy.

A Quick Comparison of Water Meters Helps

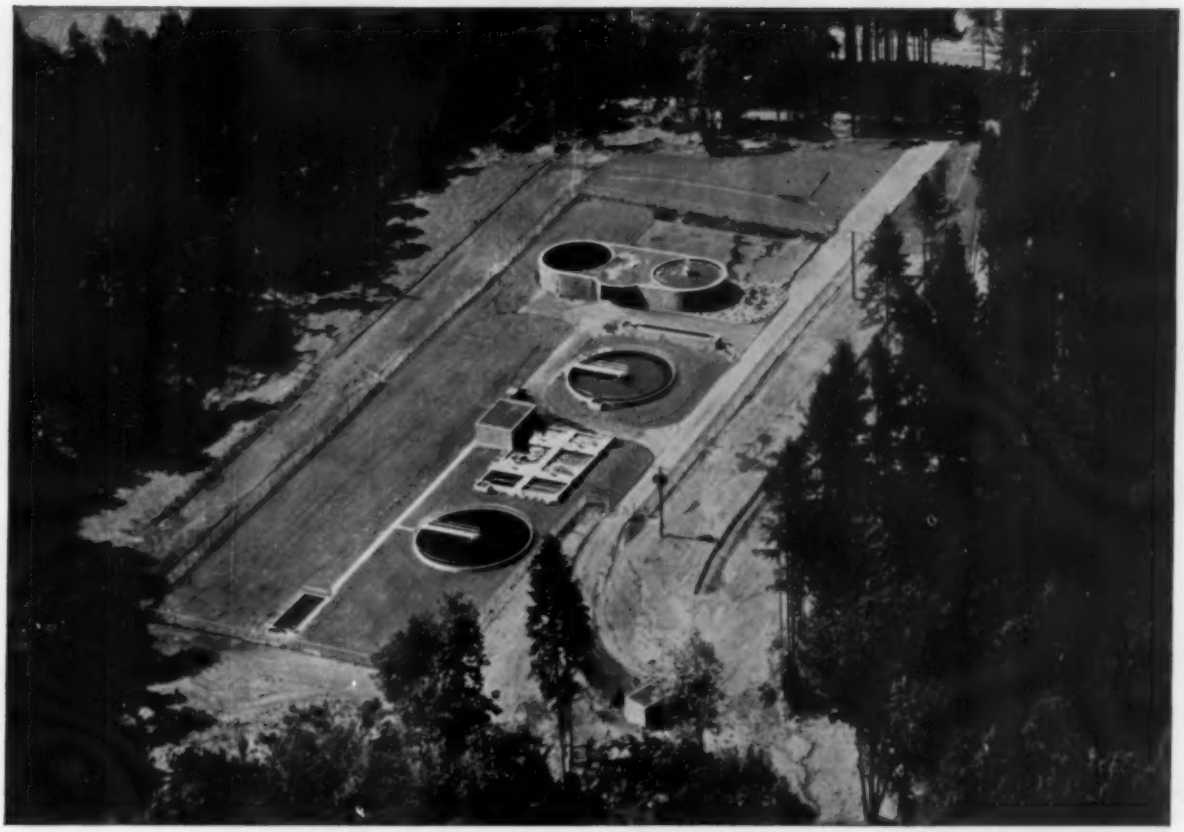
274. That is the purpose of the new bulletin describing the newest accomplishments in water meter design and manufacture. With it comes a Condensed Catalog of the Rockwell line. Ask for Bulletin No. W-811 from Rockwell Mfg. Co., 400 N. Lexington Ave., Pittsburgh 8, Pa., or check the card.

Do You Know the Value of the V-Notch?

295. A new booklet tells what you want to know about how chlorine feeding can be made as regular and precise as the sunrise. Ask for "The V-Notch Story" direct of Wallace & Tiernan Inc., 25 Main St., Belleville 9, N. J., or check the card-number.

Book Tells How to Control Algae

371. Details on the control of various microscopic organisms frequently found in water supplies are furnished in a 44-page booklet offered by Phelps Dodge Refining Co., 300 Park Ave., New York 22, N. Y. Check the reply card.



Hillsboro, Oregon, adopts
Activated Sludge Treatment
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A high degree of treatment, made necessary by minimum river flow during the summer and the presence of parks, picnic grounds and swimming areas downstream, is achieved in this 1.25 MGD activated sludge plant for the City of Hillsboro, situated west of Portland, Oregon. Overall B.O.D. reduction is well in excess of 90%.

Key to successful operation is the use of the D-O Aerator – a radically new design providing exceptionally high oxygen absorption efficiency, with virtually no problems of clogging and maintenance. Treatment units include 45′ dia. Dorr Primary and Final Clarifiers and four D-O Aerators. Two Aerators are installed per basin. Each basin is 56′ long x 18′6″ wide x 15′ s.w.d. to provide a liquid design detention of three hours. For information on the new D-O Aerator, write for Bulletin No. 7316 to Dorr-Oliver Incorporated, Stamford, Connecticut.

Consulting Engineers: Stevens and Thompson, Portland, Oregon.
Contractor: Lloyd B. Reed, Portland, Oregon.

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To order these helpful booklets check the reply card opposite page 34.

REFUSE COLLECTION AND DISPOSAL

Where Does It Go From Here?

63. That is the title of new 12-page booklet, D 930, with thorough discussion of garbage disposal by sanitary landfill method. Read the latest report from the experts. Caterpillar Tractor Co., Peoria, Ill., or check card.

Make Molehills out of Your Refuse Mountains

94. New and better ways of refuse and garbage collection and handling are described in newest literature on collection systems employing giant containers, bodies and trailers that speed your work, cut costs, improve sanitation. Adaptable to small cities as well as large. Write Dempster Brothers, Dept. PW, Knoxville 17, Tenn., or circle the number on our card.

Versatility, Compaction Force Account For Extra Packer Capacity

159. The many advantages of this modern packer unit have been combined into a fact-filled bulletin entitled "The Big Squeeze" which is available from E-Z Pack Div., Hercules Galion Products, Inc., Galion, O.

Literature Describes M-B Contain-O-Pack System

190. A 6-page catalog describing the M-B Contain-O-Pack, a complete low cost containerized refuse system for private haulers and municipalities is available from M-B Corp., New Holstein, Wisc. Check the reply card.

Methods and Benefits of Sanitary Landfill

409. Information on Sanitary landfill methods, organization and necessary equipment with which to carry out the job is available from the Construction Machinery Div., Allis-Chalmers Mfg. Co., Milwaukee, Wis. Bulletin MS-1159.

How to Construct A Sanitary Fill

331. A new 12-page booklet which tells the most efficient method of sanitary fill construction and furnishes complete information on planning and operation is now available from Drott Mfg. Corp., Milwaukee 15, Wis. Get your copy by checking the reply card: you'll find this booklet both interesting and valuable.

Pushbutton Refuse Collection

469. Pushbutton control of the packing cycle is just one of the many features of the Mark II Collectomatic refuse collection unit. In addition the unit offers fast, safe loading: "Duo-Press" compaction; positive ejection without raising body; simplified maintenance. 13, 16 and 20 yd. capacities. For all details get Bulletin BH-60106 from The Heil Co., Milwaukee 1, Wisc. Use the inquiry card.

•

WEED CONTROL

Weeds Controlled by Using Simazine 50W

151. General weed control is accomplished by using Simazine 50W and water. For full information on this new pre-emergence herbicide and how to use it write Geigy Agricultural Chemicals, P. O. Box 430, Yonkers, New York.

Control Weeds and Brush Along Highways

640. Literature from Diamond Alkali Co., 300 Union Commerce Bldg., Cleveland 14, Ohio, describes how use of weed and brush killers help reduce accidents and also included is a handy, ready-reference control chart that covers weed control problems, quantity of solution to use and economical application. Check the reply card.

SNOW AND ICE CONTROL

Uniform Salt Spreading Saves Material

42. The wide, thin pattern provided by Tarco "Scotchman" spreaders avoids salt waste, saves time and labor. Get Folder BL for full details on their spreader and table of material application rates. Use reply card or write Tarrant Mfg. Co., Dept. PW, Saratoga Springs, N. Y.

Snow Plows For Every Need

294. Frink snow plows are designed to meet snow removal needs at airports, parking lots and streets and highways. They consist of four basic types with models to fit trucks 1½ to 12 tons. For complete data write Frink Sno-Plows, Inc., Clayton, N. Y.

Plan for Bare Pavements All Winter

470. Helpful folders on clear pavement winter maintenance by use of chemical mixtures are offered by Solvay Process Division, Allied Chemical Corp., 61 Broadway, New York 6, N. Y. Circle number on reply card.

Complete Ice and Snow Fighting Equipment

523. Snow plows in 55 models and 9 types, material spreaders with width of spread of 8 to 20 ft. and hopper capacity of 2 cu. ft., and truck grader ice blades are covered in literature from Wausau Iron Works, Wausau, Wisc.

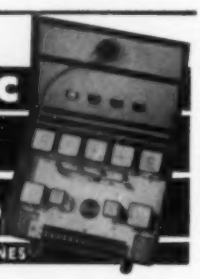
Salt, Sand and Cinder Spreaders

532. . . . are fully discussed in folder outlining how these are dump body mounted for quick attachment and detachment according to service and season. Basic specifications outlined. Just address Baughman Mfg. Co., Jerseyville, Ill. or use the reply card.

Synchro-Start

FULL AUTOMATIC ENGINE CONTROLS

FOR GASOLINE DIESEL & GAS ENGINES



Synchro-Start's new protective engine controls have been designed, for the starting and stopping of engines from remote pilot devices, such as pressure switches, float switches, power failure relays, etc., and are completely automatic in operation.

These dependable controls are encased in a steel, dust proof cabinet, and now feature enclosed PLUG-IN RELAYS as well as OVERLOAD BREAKERS. The plug-in relays simplify what little field maintenance that may have been required in older models, while the overload breakers eliminate the necessity of replacing fuses.

In designing this unit we have used the same high quality materials and workmanship that our customers have come to expect throughout Synchro-Start's 27 years of manufacturing engine controls.

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The Clay Pipe Industry's research has pioneered dramatic new developments, making production and installation of lifetime Vitrified Clay Pipe more efficient and effective.

For example, Clay Pipe Industry research discovered the revolutionary resilient compression joints which are now offering important savings in installation time and cost to users of lifetime Vitrified Clay Pipe sanitary sewers.

Other important tests are now going on at the Crystal Lake facility, by contract at colleges and universities all over the country, and at the modern laboratories maintained by individual Clay Pipe manufacturers.

One experiment that promises to have far-reaching effects: detailed, year-long observations of root penetration of 16 separate sewer pipe joints. Others include shear load studies of both pipe material and joints, development of new, less expensive jointing materials and techniques, exhaustive analyses of competitive products, flow-coefficient studies, and various tests aimed at improving the clay pipe itself.

Results of the most significant of these tests will be announced as they become available.

Under the direction of A. J. Reed, NCPMI Vice President and Director of Research, new breakthroughs in manufacturing and uses of Clay Pipe are being made, offering greater, more confident service to those who specify and use lifetime Vitrified Clay Pipe.

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COMPRESSION SEALED, VITRIFIED

CLAY PIPE

THE STANDARD in SANITARY SEWERS

IMPERVIOUS

NATIONAL CLAY PIPE MANUFACTURERS, INC.
914 20th Street, N. W.
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Please send me full details on the new factory-made compression joints on Clay Pipe.

(name)

(company)

(street address)

(city and state) 8-1C1 PW

To order these helpful booklets check the reply card opposite page 34.

Manual on Filter Bed Agitators

206. General information-specifications and installation data regarding the application of Palmer agitators, or rotary surface wash in vertical and horizontal pressure filters—round, square and rectangular open gravity type filters are covered in Manual from Palmer Filter Equipment Co., 822 East 8th St., P. O. Box 1696, Erie, Penna. Check the reply card.

Tips for Installing Orangeburg Pipe

336. Good practice for installation of Orangeburg pipe and fittings is outlined in an illustrated four-page bulletin made available by the Orangeburg Mfg. Co., Div. of The Flintkote Co., 375 Park Avenue, New York 22, N. Y. Trenching and backfilling, pipe laying, cutting and connecting.

Water and Sewage Treatment Superintendents!

391. You can profit from this 16-page revised bulletin on 55 types of continuous processing equipment useful in your plants. Ask for Bulletin 7004, free from Dorr-Oliver, Inc., Stamford, Conn., or we will get it for you if you check the card-number.

Controls for Water and Sewage Pumps

428. Condensed data sheet gives you valuable information on applications and operation of Roto-Trol controls. Before you design automation in pump service, write Healy-Ruff Co., 2255 University Ave., St. Paul 14, Minn., or check card number.

Data on Adjustable-Speed Magnetic Drives for Low-Lift Pumps

465. A catalog is available from Electric Machinery Mfg. Co., Minneapolis 13, Minn. that tells all about E-M Vertical Synchronous Motors and Magnetic Drive Units. Engineers check the reply card for information on this equipment for sewage pumps.

27 Diesel and Carbureted Engines Detailed in one Booklet

527. Describes and illustrates all types, from 16.4 to 385 hp., in weights 279 to 6,045 pounds. A brief, handy way to review available industrial engines. To get your copy, write for pamphlet CK-764-K to International Harvester Co., 180 N. Michigan Ave., Chicago 1, Ill. or circle the number on our card.

Floatless Liquid Level Controls

543. Catalog describes the B/W system of liquid level control, liquid level relays, electrodes, signals and alarms with descriptions, charts and diagrams of typical applications. Check the reply card or write B/W Controller Corp., Birmingham, Mich.

Use The Reply Card

Air Control Valves For All Types of Pipelines

620. Literature on Crispin Air Valves, which safely control air in lines handling liquids, to maintain efficient operation and prevent expensive failures, is available from Multiplex Manufacturing Company, Dept. C, Berwick, Pa. Write today for your copy of the Crispin Air Valve Catalog, which offers complete information on the full line of dependable Crispin Air Valves.

Electronic Locators for Water Mains, Services, Valves and Boxes

677. Miniaturized line locator that is encased in a molded glass fibre container and has transistors that have a rated life of 70,000 hours and weighs only four lbs. when completely assembled is described in literature from Wilkinson Products Co., 3067 Chevy Chase Drive, Pasadena 3, Calif. Check the reply card.

Submersible Pumps

431. Are described, pictured and specifications given in a 12-page bulletin that also indicates their many uses and advantages. For your copy ask for Bulletin No. BJP-58-42 of Byron Jackson Pumps, Inc., 2301 E. Vernon Ave., Los Angeles 58, Calif.

When the Frost is on the Meter

615. If it is an American frost-bottom meter freezing is no major problem. The replaceable center section breaks out leaving the mechanism undamaged. Bulletin 58 tells the story. Address Buffalo Meter Co., Inc., 2917 Main St., Buffalo 14, N. Y., or circle reply card.

Water Service Hydrants and Outdoor Drinking Fountains

661. Water service hydrants in 4 sizes, ¾", 1", 1½" and 2" and all types of outdoor drinking fountains are described in a well-illustrated, 24-page catalog from The Murdock Mfg. & Supply Co., 426-30 Plum St., Cincinnati 2, O.

Bulletin Covers Step-by-Step Action on the Water Problem

689. A step-by-step outline of action telling how the responsible citizens can help their officials extend and improve the local water system through more adequate rate structures on financing is covered in this bulletin available from Thos. F. Wolfe, Managing Director, Cast Iron Pipe Research Association, 3440 Prudential Plaza, Chicago 1, Illinois.

Water Filtration Costs Can Be Reduced

672. The "Celite" system of diatomite filtration makes possible reduced installation cost, with space requirements a fraction of those for equivalent sand filtration. For informative literature write Johns-Manville, Box 14, New York 16, N.Y.

*KLEAN-KOTE IS A TRADE-MARK, U. S. PATENT APPLIED FOR. SILVER-GRAY BAND REG. U. S. PAT. OFF.

Over 300 million feet in use coast to coast!

The test of time has proved the high quality of Orangeburg *Root-Proof* Pipe and Fittings for house sewer lines, downspout run-offs and other underground, non-pressure uses.

Orangeburg's Taperweld Joints seal root-proof and watertight. No leakage, no infiltration. And because it's made of a strong, tough non-metallic material, Orangeburg does not rust. Alternate freezing and thawing...acids and alkalis do not affect it.

All these qualities plus speed, ease and economy of installation have gained for Orangeburg a growing acceptance among leading approving authorities, architects, engineers, builders and plumbers. Over 300 million feet are in service from Maine to California.

And now, only Orangeburg has exclusive new *klean-kote* protective coating for cleaner, safer handling. The Silver Band identifies *klean-kote* Orangeburg: *Root-Proof* Pipe for sewer lines; *Perforated* Pipe for foundation drains, septic tank disposal fields. Orangeburg exceeds requirements Federal Spec. SS-P-356 and Commercial Standard CS 116-54. Write Dept. PW-21 for Engineer's independent report.

klean-kote® ORANGEBURG® FLINTKOTE

Root-Proof and Perforated Pipe

Orangeburg Manufacturing Co., Orangeburg, New York. Division of The Flintkote Company, Manufacturer of America's Broadest Line of Building Products

18 Hydro E-Z Packs pick up 9 million pounds of refuse monthly!

6140

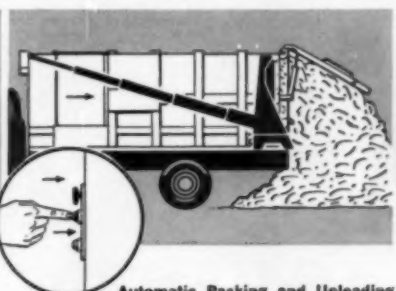
WALTER E. MIXON, JR.
Superintendent,
Dept. of Sanitation
Jackson, Mississippi

"We've increased pickups more than 50% ...and at a savings of $50,400 per year."

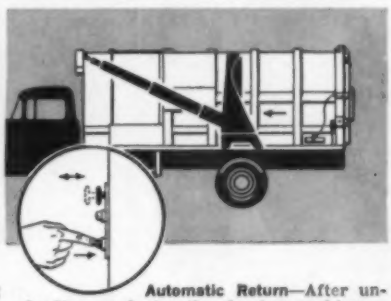
The city of Jackson, Miss., is served by a fleet of 18 Hydro E-Z Packs which pick up more than 9 million pounds of refuse every month. To handle this huge refuse pickup, Walter E. Mixon, Jr., Superintendent of the Jackson Department of Sanitation, chose Hydro E-Z Pack. "Hydro E-Z Packs do a more thorough and complete job than any other type unit we tested," says Mixon. Jackson's E-Z Pack fleet *services more than* 21,000 homes and 1600 businesses. What's more, the annual operating cost of their refuse removal program has been reduced $50,400. A savings of $2800 for each E-Z Pack in operation. Trips to the dump have been reduced too, because of the high compaction rate of 76,600 pounds exerted on the load in every E-Z Pack.

Refuse removal problem? See your Hydro E-Z Pack Distributor or send for free copy of "The Big Squeeze."

Automatic Clearing—With the Push-Pull Switch in the "out" position, the middle button is depressed and the packer blade clears the loading hopper area; then returns to its original position, automatically



Automatic Packing and Unloading—With the Push-Pull Switch in the "in" position, the middle button is depressed and the packer blade moves to the rear of the body exerting pressure to compact the load. To unload, the same procedure is followed.



Automatic Return—After unloading, or during the clearing, packing or unloading cycles, the packer blade can be returned to original position by depressing lower button regardless of setting of Push-Pull Switch.

Hydro E-Z PACK

HYDRO E-Z PACK®

DIVISION OF HERCULES GALION PRODUCTS, INC., GALION, OHIO U.S.A.

NEW LEECE-NEVILLE 40-AMP ALTERNATOR

6000-series alternator answers the need for adequate electrical power at lower cost

Leece-Neville, since 1946 the pioneer and leading supplier of alternators for heavy duty automotive service, announces a new, compact 40-Ampere alternator priced in line with comparable DC generators.

If you experience costly battery failures and other electrical system troubles with vehicles in your fleet, but feel that the money difference for 50 to 60-Ampere alternators previously available is too much to justify in your type of operation, Leece-Neville's new 6000-Series Alternator is the ideal solution. Under normal operating conditions, this power-packed alternator has a 40-Amp rating, and delivers 5 to 10 amperes at curb idle. With this unit, your battery is used only for starting the engine, remains charged at all times.

The new L-N 6000-Series Alternator is backed by Leece-Neville's 14 years of extensive field experience with heavy duty alternators, and by a 50-year reputation for building quality electrical equipment. Designed and constructed to Leece-Neville's usual heavy duty concepts, it will be available as factory-installed special equipment through almost all vehicle manufacturers.

RUGGED DESIGN... QUALITY CONSTRUCTION... HIGH PERFORMANCE AT LOW COST

- Compact and lightweight for savings in both space and weight.
- High performance 40-Amp rating at low cost in line with comparable DC generators.
- 5 to 10 amperes at curb idle.
- Replaceable built-in Silicon rectifiers mounted in separate high efficiency heat sinks, and protected from alternator heat (stator and rotor heat losses).
- Sealed anti-friction ball bearing at the drive end... efficient roller bearing at slip ring end.
- Slip ring assembly fully shielded to protect brushes and slip ring from contamination, assuring long life.
- Exclusive soldered connections between heat sinks and rectifier cells for better electrical and thermal conductivity.
- Silicon diodes (rectifiers) have built-in overload and high temperature capacity.
- Self-limiting current requires only simplified voltage regulator.
- Positive or negative ground types available.
- 6-volt types available.
- Reversible—clockwise or counter-clockwise rotation, limiting stock requirements.
- Heavy duty design concepts (protected windings, splash proofed, etc., at no extra cost to you).

TYPICAL TYPES OF SERVICE WHERE THE 6000-SERIES ALTERNATOR WORKS LIKE A TROJAN

Door-to-door Delivery
Taxis, Officials' Cars
Motor Freight
Civil Defense
Utility Companies
Construction
Ham Radio Cars
Suburban Police Units
Air Conditioned Cars
And many, many more—including your personal car!

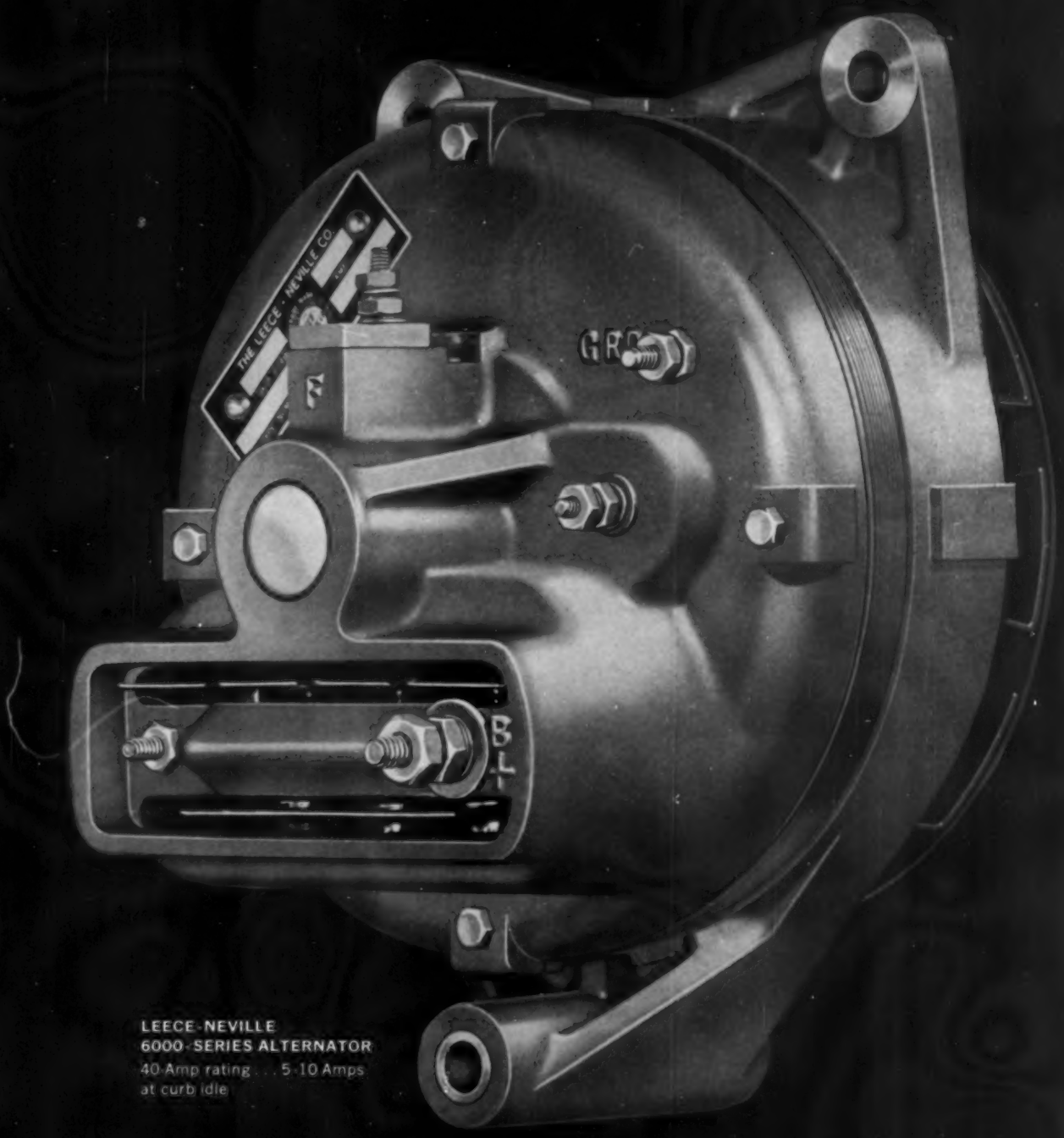
ALTERNATORS FOR ALL! Leece-Neville offers you alternators for *every* type of service, from passenger car to the biggest truck or tractor—all designed to save batteries, cut maintenance costs and practically eliminate downtime caused by electrical failure. For more information about the new 6000-Series Alternator, or alternators for heavy duty service, just mail the coupon at the left.

QUALITY ELECTRICAL EQUIPMENT
Leece-Neville
SINCE 1909

The Leece-Neville Company, Dept. PW-2
1374 East 51st Street • Cleveland 3, Ohio

Please send me more information on:
☐ 6000-Series Alternator
☐ Heavy Duty Alternators

Name _____ *Title* _____
Company _____
Address _____
City _____ *Zone* ____ *State* _____
Type of Service _____



LEECE-NEVILLE
6000-SERIES ALTERNATOR
40-Amp rating . . . 5-10 Amps
at curb idle

COMPACT...LIGHTWEIGHT...
HIGH PERFORMANCE...LOW COST

CHEVROLET IFS FRONT INDEPENDENT SUSPENSION "WALKS" WHEELS OVER TRUCK-BUSTING BUMPS!

Chevrolet truck wheel action on rough road surface, as depicted by 4 stage stop-action photography.

CHEVROLET I.F.S. PROTECTS YOUR PROFITS THESE THREE WAYS:

1 *Rides down high maintenance costs.* When a bump looms up, Chevy's independently suspended front wheels "walk" right over it. Most road shocks and jolts never reach the chassis, cab or body. The truck rides *smoothly*, takes less of a beating, stays in cost-saving shape longer. Your income doesn't dribble away in big repair bills. And you don't lose money through excessive downtime, either.

2 *Rides cargoes over rough spots with less damage . . . minimum loss.* Thanks to those same "walking wheels," loads don't do much bouncing in the body of a '61 Chevy truck. That means you don't have to contend with undue cargo damage that eats away at your earnings. (Chevy's load-tailored *rear* suspension helps protect cargoes, too.) This sure protection for fragile loads—and profits—is standard in 1961 Chevrolet trucks of every weight class.

3 *Rides drivers through with less fatigue—for tighter schedules.* Wait till you see how Chevy front wheel action works to eliminate tiring shimmy and steering-wheel fight. It means that the man at the controls can stay there longer with less fatigue—stay on schedule and do a bigger day's work. (Another reason you can look for faster schedules is that Chevy's bump-beating wheel action allows faster safe speeds on rough roads.)

That gives you an idea of how Chevy Independent Front Suspension works to move you ahead in the money-making department. And it's available in 165 Chevrolet models for '61, from new Corvair 95's to 36,000-lb. GVW tandems. Check it out with a demonstration ride at your Chevrolet dealer's, sometime soon. . . . Chevrolet Division of General Motors, Detroit 2, Michigan.

INDEPENDENT FRONT SUSPENSION

In Chevy, each front wheel, suspended independently, is free to step cleanly over bumps (see left). Each works smoothly to reduce objectionable jolts so characteristic with I-beam axle design (right). Working with load-tailored rear suspensions in every weight class, I.F.S. provides the basis for profit-protecting performance that's unmatched by I-beam axle trucks.

I-BEAM AXLE DESIGN

1961 CHEVROLET STURDI-BILT TRUCKS

CHEVROLET

Refuse Collector "Doubles" in Snow Removal

Dumpmaster clearing bridge prepares to empty snow scoop into its compaction body.

DEMPSTER-DUMPMASTER with Snow Scoop Performs Valuable Emergency Duty . . .

The DEMPSTER-DUMPMASTER, in service in most leading cities as a collector of containerized refuse or as a hand-loaded packer for trash and tree trimmings, now offers its owners still another valuable service. With the addition of a low-cost, snow-scoop container, the Dumpmaster becomes a highly efficient snow-removal device.

Taking up only one lane of traffic, the Dumpmaster moves along the curb, driving its snow scoop into the piled-up snow. When full, the scoop is lifted overhead and emptied into the compaction body hopper. Here, it is compressed by the 60,000-pound pressure of the packer plate, making room for bigger pay loads.

When full, the Dumpmaster proceeds to a nearby disposal point where it hydraulically ejects the huge icy cube that once was tons of traffic-clogging snow.

This type of versatility is just another reason that the Dumpmaster is your best buy in mechanized refuse collection.

Snow is dumped into compaction body.

Huge cube was once traffic-clogging snow.

DEMPSTER DUMPMASTER

Write Today for
FREE BROCHURE
DEMPSTER BROTHERS
Inc.

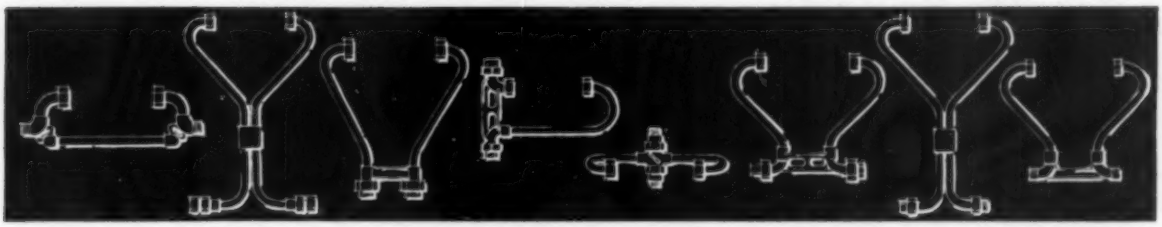
Dept. PW-2, Knoxville 17, Tenn.

if your meter settings look like this...

try one of these

MUELLER®

COPPER meter yokes!



Straight line type | Flexible type | Vertical type | Corner type | Basement type | Horizontal type | Flexible relocater type | Relocater type

■ Now available in a full range of sizes with O-ring angle meter stops, multi-purpose end connections, compression couplings and test valves optional.

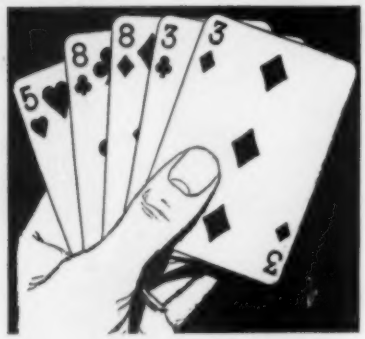
Write for complete information and specifications.

MUELLER CO.
DECATUR, ILL.

Factories at: Decatur, Chattanooga, Los Angeles
In Canada: Mueller, Limited, Sarnia, Ontario

5801

POKER? Play to win!



How would you play this hand?

You'll be the high hand before the draw about 3 times out of 5, but the odds are roughly 12 to 1 against helping on the draw. Odds are better than even somebody will beat you. Don't open. Don't call. Tough? Yes, but be patient...and win.

Here's a sure winner from FORD:

Ford pays half your fuel bills for a full six months (or 400 tractor hours) on the purchase of any new Ford or Fordson diesel tractor.

This offer, made possible by the amazing fuel-saving performance of these low-priced diesel tractors, expires March 31, 1961.

No "hidden" price increase... no tricks of any kind. See your Ford Tractor Dealer for all the money-saving details!

Tractor and Implement Division
Ford Motor Company,
Birmingham, Michigan

Ford
TRACTORS
EQUIPMENT

LEGAL ASPECTS OF PUBLIC WORKS

MELVIN NORD, Dr. Eng. Sci., LL.B.

Depression in City Street

Murphy v. City of Milwaukee, 105 N.W. 2d 794, a Wisconsin case decided Nov. 4, 1960, was an action against the City by a driver and a passenger of an automobile, the front wheels of which fell into a depression in a City street and which stopped abruptly when the undercarriage struck a manhole. This sudden stop caused the plaintiffs to be thrown forward, sustaining personal injuries. The complaint alleged that the City was negligent in maintenance of the street.

The background facts were as follows: On Sept. 10, 1956, an excavation was dug by a contractor in the approximate location of the depression which caused the accident and injuries to the plaintiff. This excavation was made under a permit issued by the City to the contractor for the purpose of laying a sewer lateral to a house fronting on the street. The excavation was backfilled on Sept. 13, 1956 by the contractor, and an inspection was made by a city inspector on the same day. The City records disclosed that he made an inspection and found no fault. His supervisor testified that the inspection ordinarily made is visual and no tests are made. "The inspection includes the material that is apparent on the surface, what type of material, whether it is filled to grade and not humped excessively, in other words, that the road is left in approximately the same condition as it was when they started." The injury occurred on March 30, 1957.

At the trial, the City and the plaintiff driver were both found to be negligent; under Wisconsin law, contributory negligence does not wipe out the claim, as in nearly all states, but goes only to reduce the recoverable damages. The jury thus apportioned the negligence as follows: the City—60%, the driver—40%.

On appeal, this verdict was upheld. The court said, "Most people have observed freshly-filled excavations, and the sinking of material with which holes have been filled. It is common knowledge that the type of material used, and the processes used for the purpose of packing the material affect the permanency of a fill. We conclude that the jurors could determine in the light of their experience that the inspection made on September 13th was inadequate."

Combined Bid

Consolidated School District No. 22 v. Frey, 105 N. W. 2d 841, a Wisconsin case decided Nov. 1, 1960, was an action for breach of contract by a school district against one who bid on a contract for construction of a new school building.

The Supreme Court of Wisconsin held that, where a bidder submitted a combined bid, broken down to show on separate sheets of paper the amounts for each branch of the work included, and the school board attempted to accept as bids the figures for heating and ventilating only, while the bidder told the board that it was a combined bid no part of which could be separately accepted, the combined bid did not constitute separate offers on the heating and ventilating portions.

Consequently, the bidder's refusal to execute a signed contract for the heating and ventilating alone was not a breach of any contract.

Surface Water Damage

City of Fort Worth v. Miller, 336 S.W. 2d 296, a Texas case decided May 13, 1960, was an action against the City for recovery of damages to private property.

Certain construction work in connection with the grading and paving of streets and in connection with provision of drainage facilities in a new subdivision in the City of Fort

City of Victoria, Texas, uses an LW 550 and 440 grader for building roads, blading streets, cleaning ditches, and laying asphalt. On ditching work like that shown — or on any job where space is restricted — Victoria's power-moldboard-equipped "550" saves time and does better work. Operator merely slides blade in and out when working around culverts and driveways.

How LW grader advantages pay off for you!

ENGINE

Choice of GM or Cummins on all LeTourneau-Westinghouse models, 85 to 190 hp. Power is delivered to wheels through a friction-free drive.

More usable power

Which ever engine you select, you can be sure it offers all the high work-producing torque you'll ever need. You get greater operating efficiency . . . more work done!

TRANSMISSION

Standard-shift models have 8 forward speeds to 26 mph, 4 reverse gears, and 3 optional extra-slow creepers.

Handle jobs at 1 to 7 mph faster

With more gear ratios, operator handles most grading jobs at higher speed — completes up to 28% more work! Torque-converter equipped 550 and 660 POWER-*Flow*® models provide *infinite speed* ranges to 27.7 mph.

BLADE CONTROL

Enclosed gear-driven lateral shift, wide-spaced lift links, big 63" blade circle, rugged T-shaped drawbar, handy-reach arrangement of controls.

Fast, accurate blade movement

Moldboard tilt adjustment also permits fast, easy change of blade pitch. Universal blade mounting fits all moldboards.

FRAME

Heavy-duty steel channels *continuous* welded into a one-piece box-type unit.

Long life, better performance

LW frame has *no* sharp bends . . . *no* joints . . . *no* breaking points. Its distinctive arch design provides more clearance for full, easy movement of blade.

OPTIONAL ATTACHMENTS

Jebco Elegrader and Jebloader, Preco Dial-A-Slope automatic blade control, Ateco rear-mounted ripper, Bulldozer, V-type scarifier, push plate, snow plow and wing.

Stretch earthmoving dollars

LW graders adapt easily to a variety of jobs. You increase your grader work range . . . save money needed for specialized equipment.

We will be happy to tell you about all LW grader advantages and money-saving benefits. Demonstration on your job without obligation.

G-2314-PJ-1

LeTOURNEAU-WESTINGHOUSE COMPANY, PEORIA, ILLINOIS

A Subsidiary of Westinghouse Air Brake Company

Where quality is a habit

TAKE A "PROJECT LOOK" AT COMPRESSOR PURCHASES TO REDUCE EQUIPMENT INVESTMENT, SPREAD MANPOWER

SAVE WITH TASK FORCES OF SCHRAMM CO-ORDINATED AIR POWER

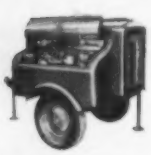
Plan your compressor buying as you plan your work projects . . . that is, to get the most work done with the least equipment and expenditure of manpower. Each SCHRAMM unit is specifically designed to do more jobs. . . . For example, the SCHRAMM STANDARD PNEUMATRACTOR is 125 compressor and tractor in one. You don't tow it or push; one man drives it. Not only saves manpower, but gets around more quickly—sets up faster, does more work. Costs far less than separate tractor and compressor.

The entire SCHRAMM line has been designed with built-in savings such as these. Each SCHRAMM unit you add will lop off the waste in operating and maintenance costs, give you more and more flexible use of men. And because you buy fewer pieces of equipment, your total initial costs are lower. An all-SCHRAMM line in your department will give you a compact task force of work-together air power equipment.

Talk to your SCHRAMM dealer, or write for details about the full advantages of co-ordinating your air-power equipment. SCHRAMM, Inc., 766 North Garfield Ave., West Chester, Pa.

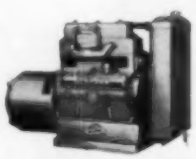
SCHRAMM

CO-ORDINATED AIR POWER



Portable Compressors save you up to 35% initial cost on 125 cfm compressors, comparable savings on every size from 20 cfm to 600. You also save 15 to 50% fuel consumption.

Pneumatractor Self-propelled Compressors cost less than comparable compressors and tractors combined! PNEUMATRACTORS drive along with work. No trucks, crews tied up.



Stationary Compressors. Electric motor or V-belt drive. Vibrationless operation—no foundation needed. They're compact, easy to move. Relocate to meet emergencies.

Worth proved to be defective or inadequate. As a result, during the course of normally heavy rains, surface waters were caused to collect rapidly at the rear of the plaintiff's property and to overflow it, causing permanent damage, i.e. reduction in market value of the property. Plaintiff brought suit under the provision of the Texas Constitution that no person's property should be damaged for public use without adequate compensation.

It was held that the City was liable for the damage proven. The liability in this case does not depend on a showing of negligence on the part of the City or its employees. The City is liable even if it was in no way negligent and the work was performed for it by an independent contractor. The liability is predicated on the provision of the State Constitution, which broadens the concept of eminent domain beyond the usual limit of "taking" property, extending it to cover "damaging" property for public use.

• • •

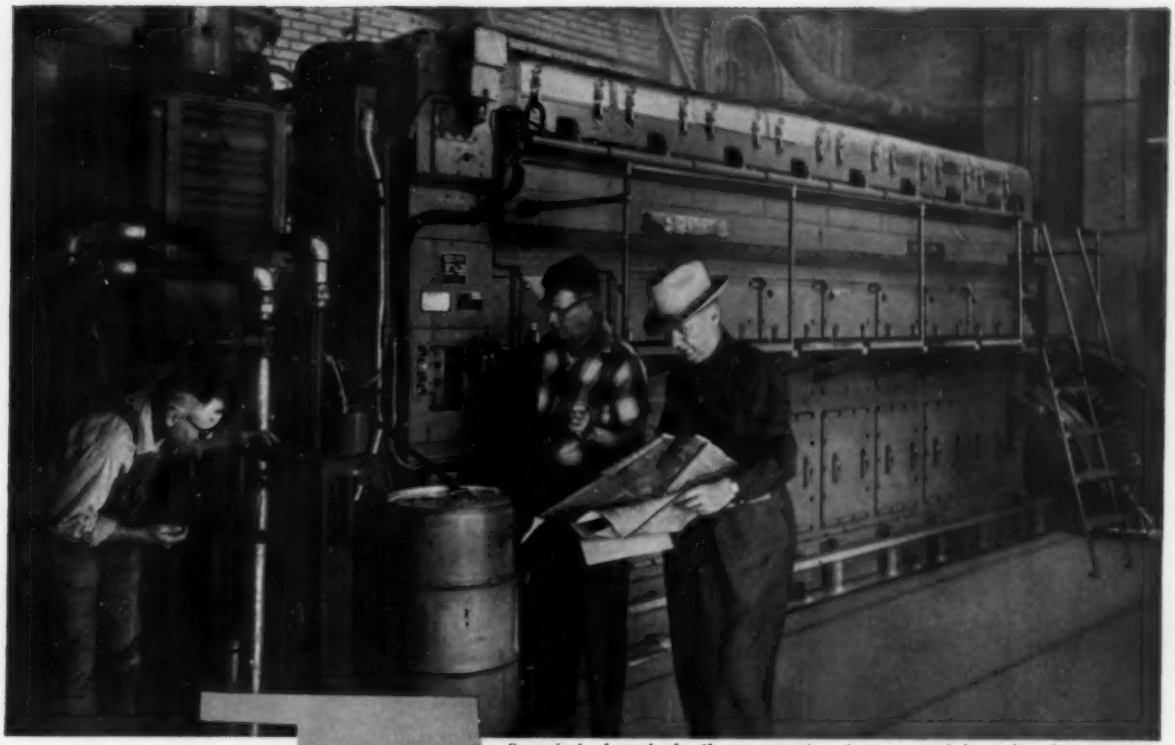
Los Angeles Plans Water Reclamation Tests

A significant step in the program to avert an indicated potential water shortage in Los Angeles County in the 1965-75 period was taken by the Board of Public Works in agreeing to participate in a 2½-year regional program of water reclamation tests to be conducted by the Los Angeles County Flood Control District personnel at the Hyperion sewage treatment plant.

The two specific steps taken by the Board in encouraging the experimental program were: 1) Granted permission to operate water reclamation tests at Hyperion; and 2) agreed to provide activated sludge plant effluent, facilities, space and technical advice as required by the test program.

A major operation by the CFCD was the use of test basins utilizing effluent from the Hyperion plant from December, 1954, to January, 1958. Satisfactory results involving ground water replenishment were obtained by using slow sand filters and injection wells but suitable areas for such sand filters are disappearing because of the development of the Los Angeles International Airport.

From its experience the CFCD found that rapid sand filters require less space and that injection wells could be supplied for at least limited periods with reclaimed waters without clogging. This test will be amplified in the new program.



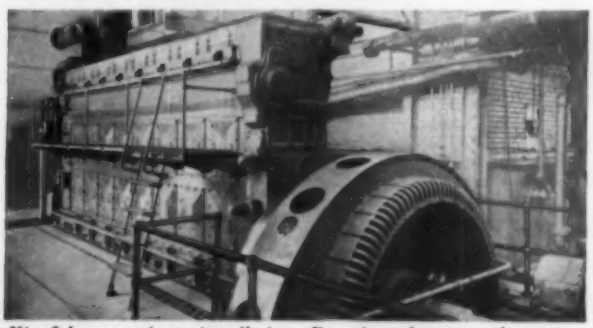
Superior's low fuel oil consumption is measured here by (left to right) Clarence Garrett, Plant Supt., A. B. Reese, Jr., White's Chief Field Engineer, and V. V. Long, Engineering Consultant, Kingfisher, Okla.

Civic thrift at Kingfisher prompts Superior Engine purchase

Kingfisher, an Oklahoma wheat belt town of 3700 population, is proud of its low municipal taxation. Earnings from the city-operated power plant pay most local operating expenses and finance periodic improvements and expansion to the plant itself. As usual, city fathers were both cautious and thrift-minded when a new engine-generator was needed recently. Their choice was a Model 80-GDSX-8 dual-fuel supercharged Superior which develops 1769 BHP at 360 RPM, to drive a 1250 KW generator.

Today many municipalities are making a "Superior decision"! Superior's highly developed open chamber combustion system is combined with a series of exclusive design developments and refinements to produce high power-to-fuel ratio. Diesels can run on a wide range of non-premium fuels including residuals, and dual-fuels operate on natural or manufactured gas, butane, propane or sewage gas. Even after extremely long periods of low-maintenance operation, replacement parts are seldom needed.

Superior's complete line of diesel, dual-fuel and gas engines range from 190 to 2150 HP, or 150 to 1500 KW. Get full information today by writing to:



Kingfisher saved on installation. Experienced power plant crew poured base and completed hook-up.

Superior ENGINES · ATLAS Imperial DIESEL ENGINES · White DIESEL

White Diesel

WHITE DIESEL ENGINE DIVISION
THE WHITE MOTOR COMPANY
Plant and General Offices: Springfield, Ohio

Save on construction costs with the new '61 FORD TRUCKS

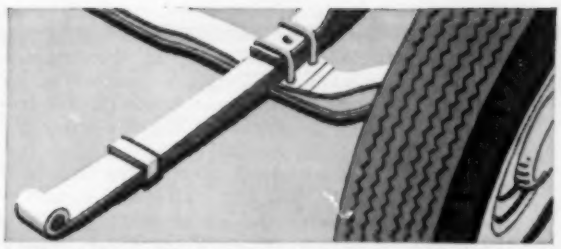
SAVE FROM $31 TO $157 ON PRICE* ALONE WITH FORD'S F-100 STYLESIDE PICKUPS

Contractors everywhere are finding that the half-ton Ford Styleside is priced below all other comparable pickups! And these rugged pickups are designed to keep right on saving with lower maintenance and operating expenses. Their durable, one-piece cab-and-box construction provides increased rigidity and eliminates a major source of rust and corrosion. Not only does the sheet metal last longer with this stronger body, but it also contributes to a quieter ride.

And you can save more . . . because you can carry more on every trip. Styleside bodies are longer and wider with loadspace increased as much as 16%. In addition, wheelbases have been lengthened 4 inches and this combined with the improved shock absorbers gives a ride that's unexcelled in its field—proven by scientific Impact-O-Graph tests. For construction work the angle of approach has been increased so you can climb steeper drives or go over deeper ditches or gullies. Ford also offers America's lowest-priced* 4 x 4 with big 8-ft. box, the F-100 Flareside.

And you can save on operating expense! Ford's Mileage Maker 223 Six is standard on all conventional pickups to keep gas costs low. The economical 292 V-8 is available for jobs requiring extra power. Both engines are equipped with Ford's Full-Flow oil filter that lets you get 4,000 miles between oil changes.

**Based on a comparison of latest available manufacturers' suggested retail delivered prices*



SAVE UP TO $150 ON FRONT TIRES! In certified tests of truck suspensions, Ford front tires lasted up to twice as long. In 50,000 miles, savings can add up to $150 on a pickup . . . more on two-tonners. And Ford's sturdy I-Beam front axle and leaf-spring suspension not only cut tire wear, but their simpler design also cuts maintenance costs.

12,000 MILE OR 12 MONTH WARRANTY

SAVE WITH GREATER DURABILITY . . . on all 1961 Ford Trucks, each part, except tires and tubes, is now warranted by your dealer against defects in material and workmanship for 12 months or 12,000 miles, whichever occurs first. The warranty does not apply, of course, to normal maintenance service and to the replacement in normal maintenance of parts such as filters, spark plugs and ignition points. Never before have you had such protection . . . such evidence of long-term economy!

SAVE WITH FORD'S NEW 262-CU. IN. "BIG SIX" ALL-TRUCK ENGINE FOR TOP PERFORMANCE AND ECONOMY

America's savingest two-tonners offer a big 262 Six with the power of big displacement, the gas economy of 6-cylinder design, plus the durability of heavy-duty construction. This engine features a sturdy stress-relieved block, strong forged steel crankshaft, long-lasting stellite-faced intake and exhaust valves, and durable pyramid-type connecting rods. And Positive Crankcase Ventilation reduces oil dilution and sludge formation to extend engine life. Ford's proven 292 V-8 and 292 HD V-8—the V-8's with "six-like" economy—are also available for your special power needs.

You also save with other new durability features like the more rugged frame, stronger radiator with new lock-seam construction, improved cab and chassis electrical wiring, plus longer, easier-riding and more durable rear springs. Ford's parallel ladder-type frame with standard 34-inch width allows you to install new or transfer your present special construction bodies quicker and for less. Also, the frame drop in the cab area lowers cab height . . . makes for easier entry.

FORD TRUCKS COST LESS

YOUR FORD DEALER'S "CERTIFIED ECONOMY BOOK" PROVES IT FOR SURE...

FORD DIVISION, Ford Motor Company.

2 NEW
RIDGID
CHAIN
WRENCHES

give real Action-Grip
in Tightest Places

Work on Round, Square or Irregular Shapes Other Wrenches Can't Reach!

In extra close quarters, there's nothing that'll beat these new RIDGID Chain Wrenches for getting the job done. Fast, ratchet-like action in either direction . . . from either side. Give tight grip without crushing. Large, easy-to-grab end ring for fast chain adjustment. Tempered steel chain locks securely . . . releases quickly. Rugged, comfort-grip, I-beam handle, guaranteed not to break or warp . . . handy hang-up hole.

Light and easy to use, these new RIDGID Chain Wrenches do everything a regular wrench can do . . . and much more. Call your Supply House and get one today!

RIDGID
The Ridge Tool Company • Elyria, Ohio, U.S.A.

Ed Cleary Says:

Rationale of Pollution Control Under Scrutiny

EDWARD J. CLEARY
Diplomate, American Academy of Sanitary Engineering
Cincinnati, Ohio

WITH SOME SEVENTY speakers on the program of the National Conference on Water Pollution there was only limited opportunity for delegates to ponder on what was said in Washington last December. For that reason it seems appropriate to call attention to two speakers whose ideas were provocative and worthy of more reflection than could be afforded at the Potomac forum. They were Karl Brandt, a member of the President's Council of Economic Advisers, and Irving K. Fox, vice president of Resources for the Future, Inc.

Dr. Brandt is a social scientist on the faculty of Stanford University. Mr. Fox has a background of experience in government administration, notably in the inter-agency activities of the U. S. Department of the Interior and with water resources programs in general. Neither of these men professed to be an expert in the technology or practice of water-pollution control. They viewed the problem from a philosophical standpoint. And one might conclude that they were puzzled by the rationale—or lack of it—displayed by sanitary engineers and others charged with the administration of pollution control.

No Prophet of Gloom

In setting the scene for his discussion, Dr. Brandt said he could not share the popular conception that desperate shortages of natural resources are the inevitable result of growth in population. He has confidence—and presented some examples to sustain it—that man's needs will continue to stimulate opportunities for human intelligence and human resources to obtain a greater yield from existing natural resources. In brief, he asserted there are no material or physical conditions, nor political or psychological reasons, for getting frantic about supposed or asserted shortages.

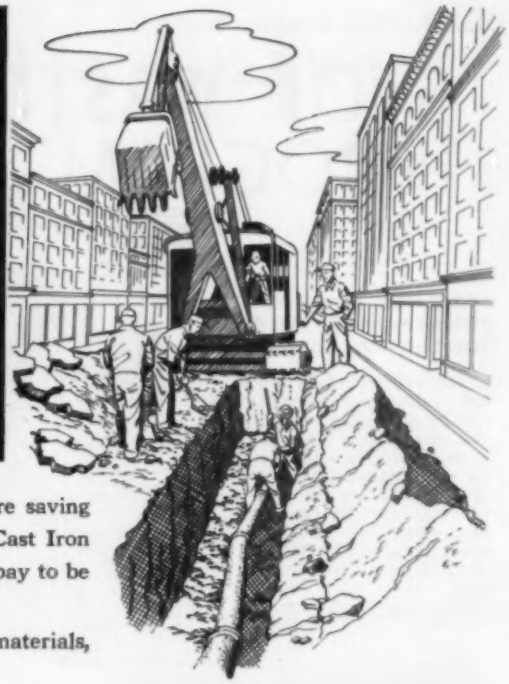
Addressing himself to water resources in particular, he said: "It is not true that nature in the raw had an abundance of water as we have to define it today. This claim of the naturalists who think in terms of an ecological balance under the exclusion of man and his supposed damaging impact on a perfect nature is of no relevance whatsoever for social scientists and for a nation's practical necessities. Nature itself pollutes a lot of water, and so do many nature-admiring campers without realizing it."

Acknowledging that developments in science and technology have enormously expanded the demand for water, particularly for agricultural and industrial use, Dr. Brandt reminds us that these developments have also expanded the opportunities and technical means for:

Capturing and storing fugitive water;

Making more intensified and economical use and re-use of water; and

How Much Would Pipe Replacement Cost Your City?



Many communities that thought they were saving money by purchasing cheaper substitutes for Cast Iron Pipe have found to their sorrow that it doesn't pay to be "penny wise and pound foolish."

However glowing the claims of substitute materials, the fact remains that—

1816 MONTREAL CANADA *10" Water Main*

1834 READING PENN. *4" Water Main*

Only Cast Iron Pipe Has a Record of Service of 100 Years and More in 112 American Cities

No other pipe ever made can match this record of long-lived service. And today's modern Cast Iron Pipe will last even longer. It is stronger, tougher, more uniform in quality than that which has served a century or more. That's why again this year, more miles of underground CAST IRON mains will be installed than all other kinds.

1828 LYNCHBURG VIRGINIA *7" Water Main*

1831 RICHMOND VIRGINIA *8" Water Main*

This advertisement is published in the interests of the Cast Iron Pressure Pipe Industry by.....

WOODWARD IRON COMPANY

Since 1882

WOODWARD, ALABAMA

GOJER, INC. Announces Its

"STOP WASTE PROGRAM"

CARELESS WASH-UP PROCEDURES ARE COSTING YOU MONEY!

A pair of dirty hands with free access to an open can of soap may well be the reason your company handcleaning bill is such a costly item. Provide an effective way of controlling the amount of soap being wasted by your employees, and you'll prevent the greatest part of your handcleaning dollar from being washed down the drain.

GO-JO'S HEAVY DUTY DISPENSER CONTROLS WASH-UPS... SAVES YOU MONEY!

Designed to eliminate waste, the Go-Jo Heavy Duty Dispenser delivers just the right amount of Go-Jo to get even the grimiest hands spotlessly clean. Go-Jo Creme Hand Cleaner is a concentrated formula containing GT-7 for dermatitis protection, plus soothing emollients to prevent chapping. When used in the Heavy Duty Dispenser, it provides four times as many clean-ups as "hand scoop" methods.

Pat. No. RE. 24312

The Go-Jo jobber serving your area will be happy to show you how to cut as much as 75% off your handcleaning expenditures. Write us today.

GOJER, INC.

Box 991 Akron 9, Ohio

MANUFACTURERS OF go-jo PRODUCTS

Upgrading water quality by better control of polluted effluents.

The contribution of the social scientist to water pollution control, concluded Dr. Brandt, lies in the exploration and demonstration of alternative courses for achieving desired results. He believes that the public in general, the legislators and the administrators ought to receive from economists and associated social scientists the best information and guidance possible on the economics of solutions offered by engineers and the proposals made by pressure groups. In particular, he noted that the allocation of costs and the accrual of benefits of pollution control are poorly understood.

If these and related issues are more clearly defined, said Dr. Brandt, "the better become the prospects for arriving at sensible solutions by voluntary cooperation and consent, rather than coercion and bureaucratic rule of more and more centralized power."

The Problem of Evaluation

Meantime, in another section of the conference, Mr. Fox was pointing out deficiencies in measuring the benefits of pollution control. He supplemented Dr. Brandt's view that there are limits to the price we will pay for clean water. And only where recognized benefits exceed recognized costs, said Mr. Fox, will it be practicable to institute effective pollution-abatement measures.

It was on this premise that Mr. Fox urged the development of a system of benefit-cost evaluation that would define the kinds of values that society may seek to optimize. Among other things, such a system must translate physical and biological effects of pollutants into measures of value.

He suggested three kinds of values: Health, aesthetic and market values. Admitting that health and aesthetics are not satisfactorily measured in monetary terms, he nevertheless did not despair that yardsticks might be devised by imaginative individuals. Concerning his last category, Mr. Fox said: "Market values are measurable in monetary terms, but for a variety of reasons in the case of water-quality management, they are not subject to optimization through market forces. Therefore, governmental action is necessary. Techniques of analysis in the field of welfare economics can be applied to the assessment of these values."

Mr. Fox then offered the following lines of study as being helpful in the design of a system of water-quality evaluation:

1) Determinations of the effect of many new chemicals upon living organisms, particularly people, and an assessment of alternative means of dealing with chemicals that have a toxic effect upon human and animal life.

2) More precise determinations of the effects of different kinds of pollution contributed at a specified upstream location upon the quality of water at a specific downstream location under different streamflow conditions.

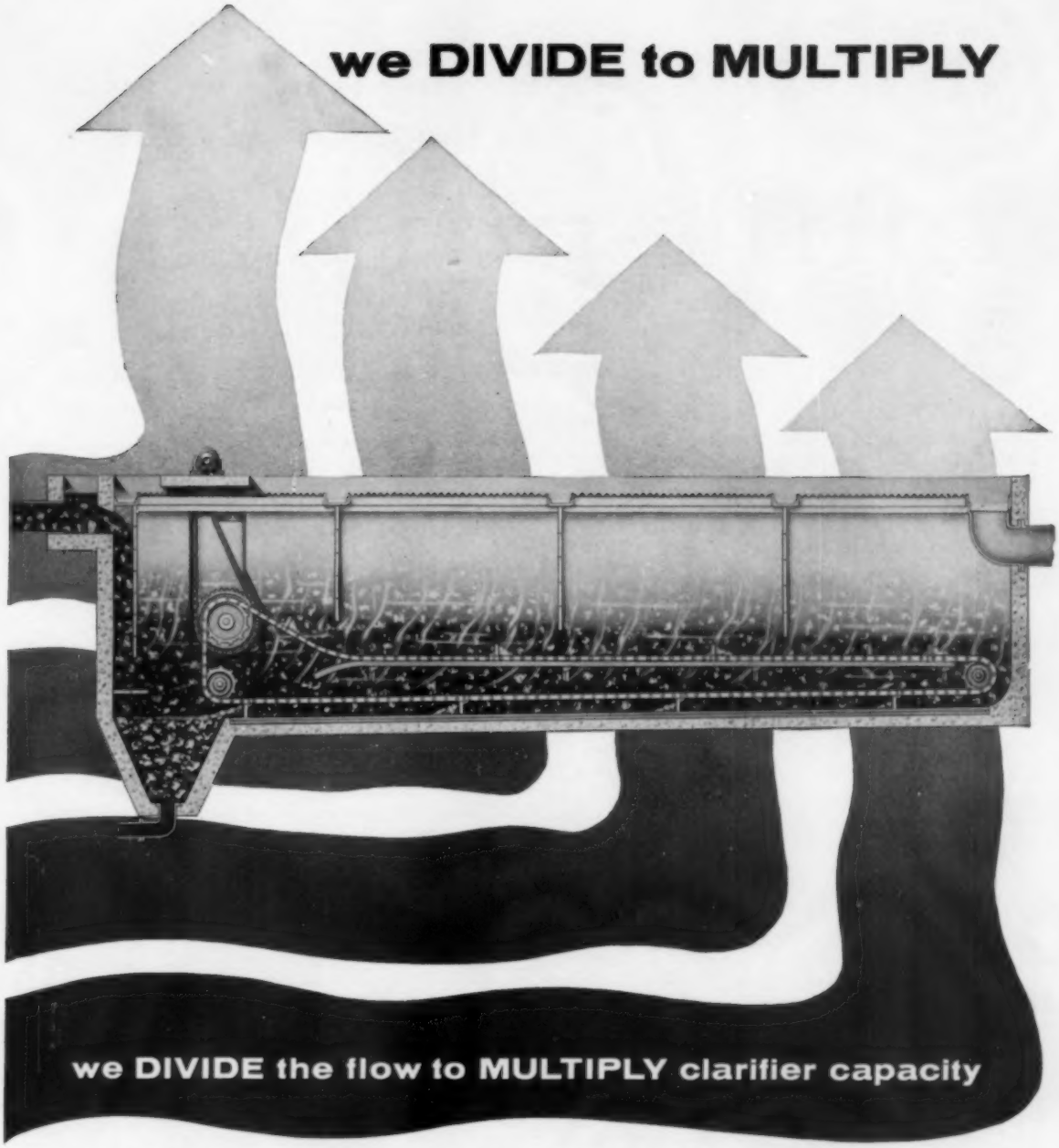
3) Determinations of the cost of providing water of appropriate quality at a given downstream location to serve specified demands in the face of potential contributions of specified quantities and types of effluent at given points upstream.

4) Determination of the incidence of costs and benefits under alternative methods of water-quality management.

5) Examination of the effect of pollution-abate-

(*Continued on page* 70)

we DIVIDE to MULTIPLY



Rex Verti-Flo not only increases the clarifying capacity of tanks up to four times; it provides a far clearer effluent. The savings in equipment and construction costs are obvious. Here's how Verti-Flo does it: The unique design of Rex Verti-Flo Clarifier transforms the conventional horizontal-flow tank into a vertical-flow tank...utilizing the *full volume* of the tank and *minimizing short-circuiting*. This is accomplished by a system of collecting troughs, weirs and partitioning baffles which divide the large, horizontal settling zone into a series of small, vertical-flow cells. To assure maximum flow length and control, the weirs are adjustable entirely around the periphery of each cell.

Installed in existing tanks, Verti-Flo can be at least double the capacity of the tank...in new installations, Verti-Flo provides up to four times more capacity so that smaller basins can be used with considerable savings in both equipment and construction costs.

For information, write CHAIN Belt Company, 4722 W. Greenfield Ave., Milwaukee 1, Wis.

REX®

CHAIN BELT COMPANY

Pipe-laying is one example of the many ways these

multi-purpose

tractor-shovels make budgets behave every month of the year

When you buy a PAYLOADER you have *more* than a tractor-shovel. You have the most *proven* tractor-shovel, and the most *useable*—because of the many and unusual kinds of allied equipment that you can use with it. Several of these tools are available *exclusively* on rubber-tired PAYLOADER tractor-shovels.

Reduces Your Equipment Costs

With this one basic machine of broadest usefulness, you eliminate the big investment in specialized single-purpose machines. You continue to cut costs because you can keep a PAYLOADER busy more hours of the day and more days of the year.

Sizes to fit your needs

From the PAYLOADER line you can select the exact size and type of tractor-shovel that fits your needs and budget because there are eight basic sizes – from 2,000 to 12,000 lb. operating capacity – and more than 20 models.

Having decided on the particular PAYLOADER that you require, you can include whatever pieces of allied equipment you want immediately – or can add them later as they are needed.

Consider the potential of a PAYLOADER – plus one or more of the following tools – to hold down your equipment budget and to get necessary work done with a minimum expenditure of time and labor:

Side-boom – an *exclusive* on PAYLOADER units – lifts up to 6 tons at 4 ft. overhang; has double-acting, hydraulic-power boom extension; does not interfere with the bucket use; can work on pavement without damage, and is available for three PAYLOADER sizes.

Four-in-one Bucket – an *exclusive* on PAYLOADER units in the rubber-tire class. This two-piece bucket performs shovel, bulldozer, clamshell and scraper operation – and is available in place of the conventional bucket on all PAYLOADER four-wheel-drive units.

Backhoes are available for front or rear mounting on several PAYLOADER sizes and are recognized as the best-engineered in the industry. One of these can be rear-mounted on several PAYLOADER sizes along with the Side-boom and 4-in-1 Bucket, and any of these three tools can be used on the same job.

Blacktop Spreader interchanges with the bucket and has its own engine power. With hopper capacity of 2 cu. yds., it lays hot or cold mix up to 8-ft. wide and up to 6-in. thick – instantly adjusts for widths up to 4 ft.

Vibratory Compactor is available for several 4-wheel-drive PAYLOADER models and interchanges with the bucket. It is self-powered and self-contained, and develops maximum densities in all granular soils.

Pick-up Sweepers are interchangeable with the buckets on several PAYLOADER models and can dump their loads directly into trucks. Separate hydraulic motors drive main and gutter brooms.

Snow Plows of all types are available, interchangeable with the bucket, including one-way, Reversible, Vee and self-powered Rotary types.

Other PAYLOADER Attachments include hydraulic earth augers, fork-lifts, winches, backfill and angling blades.

Your Hough Distributor is ready to show you how a PAYLOADER with its multi-purpose usefulness can work economies for you the whole year through.

THE FRANK G. HOUGH CO.
761 Sunnyside Ave., Libertyville, Ill.

Send data on all PAYLOADER models and the many kinds of Allied Equipment.

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THE FRANK G. HOUGH CO.
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SUBSIDIARY – INTERNATIONAL HARVESTER COMPANY

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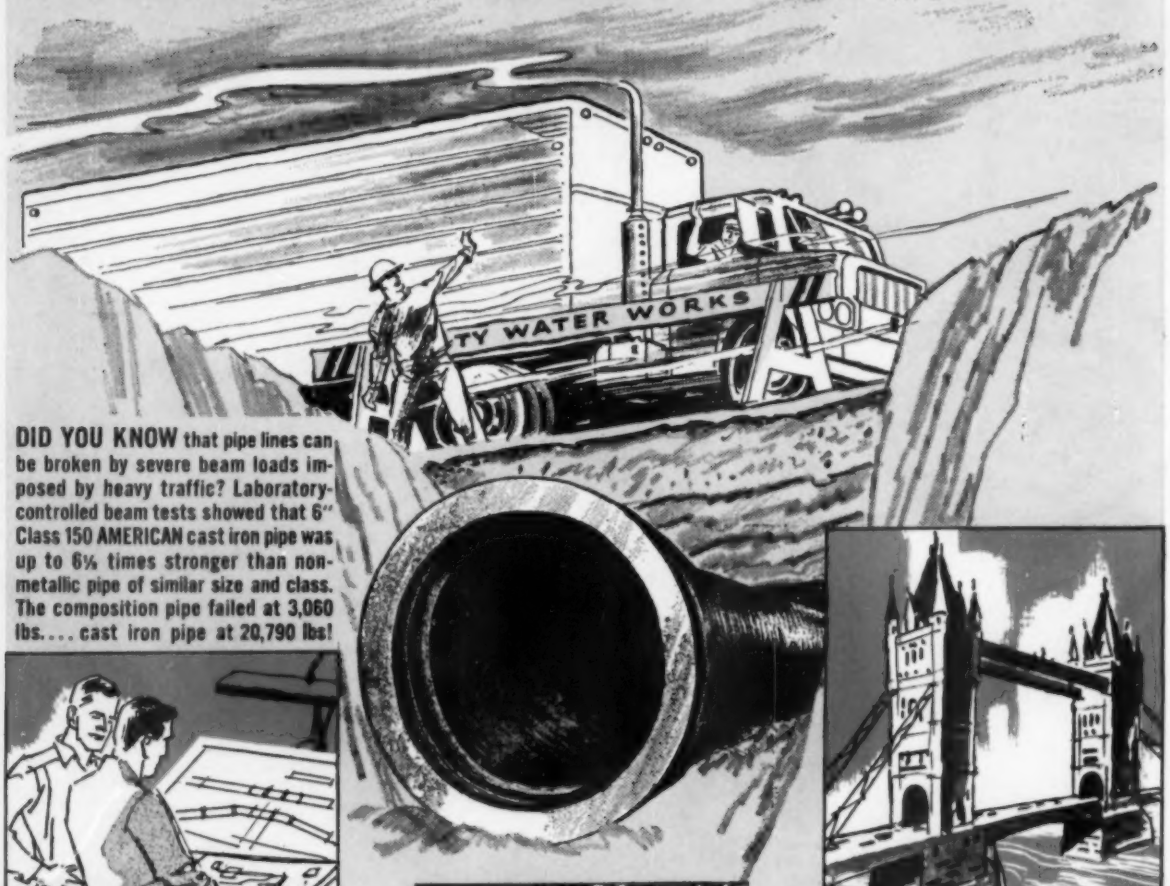
HOUGH®

PAYLOADER®

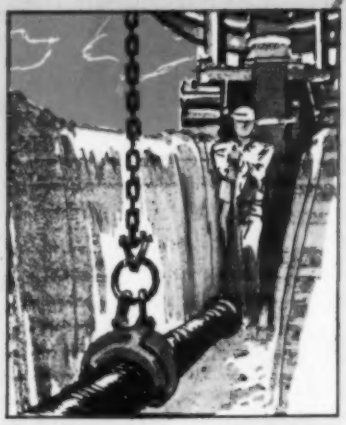
PIPE FACTS

A recent survey of hundreds of water works superintendents indicated that up to 6 to 1 preferred cast iron pipe over non-metallic substitutes.



DID YOU KNOW that pipe lines can be broken by severe beam loads imposed by heavy traffic? Laboratory-controlled beam tests showed that 6" Class 150 AMERICAN cast iron pipe was up to 6½ times stronger than non-metallic pipe of similar size and class. The composition pipe failed at 3,060 lbs.... cast iron pipe at 20,790 lbs!

DID YOU KNOW that AMERICAN cast iron pipe can be designed to withstand varying internal pressures and external loadings? Rigid A.S.A. specifications, approved by the American Water Works Association and other groups, assure water works engineers of the superior design of cast iron pipe.



DID YOU KNOW that cast iron pipe installed over 228 years ago in London, England, is still in service? And that cast iron mains installed in 1823, continue to serve New York City today? No substitute pipe can equal these authenticated records.

DID YOU KNOW that AMERICAN Fastite pipe can be assembled faster than a trencher can dig? Its exclusive, double-sealing single gasket, push-type joint is the reason why. Insert gasket ...lubricate plain end...push pipe together...and it's permanent!

AMERICAN CAST IRON PIPE COMPANY
BIRMINGHAM **ALABAMA**

4 new permanent colors in GPX plywood

• GPX is now available with acrylic overlay . . . in permanent colors of green, white, blue or red. Order it in any combination of colors front and back, or with natural or black high density one side.

• Resists severe weather and abuse. Won't rust or corrode. Can be fabricated with woodworking tools. GPX costs less, lasts longer than metal. Reflective sheeting bonds better to overlaid plywood surface.

• Strong, stiff panels light, easy to handle. Require minimum backing and framing.

• 1-piece panels up to 60" x 120", larger scarfed panels also available.

• Write today for free sample, complete data.

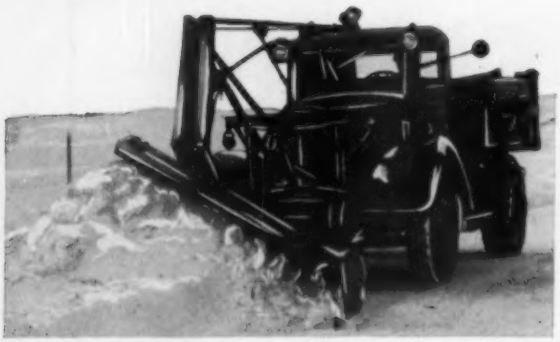
GP
GEORGIA-PACIFIC

Dept. PW 261, Equitable Building, Portland, Oregon • plywood • lumber • redwood • hardwood • pulp • paper • chemicals

LOW SPEED
or
HIGH SPEED
— same efficiency

FRINK

ONE-WAY
SNO-PLOWS



Where low speeds and careful close-to-curb windrowing is a must, FRINK One-Way Sno-Plows neatly roll and deposit the snow for easy removal by loader. On more open thoroughfares, the same plow attacks at high speeds, throwing and spreading the snow way out to prevent formation of side banks and consequent drifting.

Increased curvature and taper in the rugged, highly efficient moldboard of FRINK One-Way Sno-Plows help keep snow from coming over the top at all speeds and prevent clogging in wet snow. Automatic trip mechanism safely rides cutting edge over obstruction.

Get complete details — write now for a free illustrated catalog. Dept. PW-261.

V-TYPE • ROLL-OVER • ONE-WAY

REVERSIBLE TRIP • LEVELING WINGS

FRINK
SNO-PLOWS
INCORPORATED

FRINK SNO-PLOWS, INC.
CLAYTON, 1000 ISLANDS, N. Y.

•

EASTERN STEEL PRODUCTS, CO.
PRESTON, ONTARIO, CANADA

ment requirements upon industrial costs and in turn upon the location of industry.

6) An assessment of the outlook for technological innovation as it might alter the water management problem in the future.

It might be remarked that some of these approaches have not been absent in the conduct of certain pollution-control efforts, although it may be granted that administrative agencies have not generally been distinguished in accepting and applying them. In particular, one cannot overlook the important contributions made by Prof. C. J. Velz, of the University of Michigan, under sponsorship of the National Council for Stream Improvement of the Pulp, Paper and Paperboard Industries, Inc. Prof. Velz has pioneered—and during the past 15 years perfected—techniques of evaluation that could satisfy some of the proposals made by Mr. Fox. Also to be recalled are the studies of Maurice LeBosquet, sanitary engineer of the U. S. Public Health Service, who likewise pioneered some work on cost-benefit allocation in water-pollution control prior to his assignment to other activities.

What We Need Today

As was stated in the preamble to this commentary, the views of Dr. Brandt and Mr. Fox are provocative. But they are not necessarily omniscient. Their value lies in presenting questions, not in providing answers. And it may take a long time to find suitable answers to some of the questions, as the speakers themselves suggest.

Meantime, it would be unfortunate if the search for the answers should distract attention from the practicalities of dealing with the obvious. To some observers it already appears that regulatory agencies and the water polluters with whom they deal may become much more enamored with research than with the application of what is known. And it might be argued that it is academic flap-doodle to talk about "optimizing" benefits in situations where a community continues with impunity to foul a river with raw sewage or where an industry discharges thousands of gallons of waste oil into a waterway.

In seeking to cope with these stark realities of pollution—and there are many of them—one hardly needs to research social and economic values in order to justify safeguards in the public interest. And it becomes absurd to talk about new parameters for measuring pollution when the most elementary criteria established by the eyes and nose are not being satisfied.

None of this denies that improvement of the rationale of pollution-control practice deserves an important place in our thinking. But while we are thinking, let's be more aggressive in doing what so obviously needs to be done in the control of water pollution.

Engineering Notes

Epoxy Pavement Paints Tested

The Los Angeles City Traffic Department is nearing completion of its first tests of epoxy coatings for street and highway striping. Similar field tests are being set up by the Los Angeles County Road Department and have been conducted by municipalities in Washington, Texas, Oklahoma, New Mexico and New York.

The epoxy coating for the tests is being supplied

That "gun barrel" look is the hallmark of a superior sewer line. You'll find it wherever Johns-Manville Transite—the white sewer pipe—is used. That *look* is the big difference in the flow characteristics of the line, too! How come?

You've been on track teams. Let's suppose we have an event where the two contestants and distances to cover are equal. One contestant is to run a straight line... the other a zig-zag course. Suppose, too, that the one on the zig-zag course has to clear three hurdles to every one for his opponent. Which runner would cover the distance quicker and easier? Of course!

The more joints in a line, the more resistance to sewage movement. And this resistance can be even greater if the joints are aligned poorly—if misalignment is likely to occur after the line is in service.

Transite's long lengths, self-aligning joints mean fewer "jogs" in the line—produces that "gun barrel" look. Thus, there's less deflection of flow... sewage is carried faster so it reaches the plant fresher, lowering the cost of treatment. And the natural, smooth interior of Transite aids its superior flow characteristics—means flatter grades, shallower trenches—ground water tables reached at fewer points in the line. Add to this savings in handling, sheeting and installing, and it's easy to see why the *white sewer pipe*, Transite, never stops saving you money.

Why not drop Hartley a line to learn about Transite's other long-term benefits? Ask for your "Facts and Data Book." Write Johns-Manville, Box 14, PW-3, New York 16, N. Y. In Canada: Port Credit, Ontario. Offices throughout the world. Cable address: Johnmanvil.

COEFFICIENT OF FLOW: n = .010 (MANNING FORMULA)

JOHNS-MANVILLE
TRANSITE PIPE®

ESSICK

VIBRATING COMPACTORS

ESSICK VR-28-W PATCHING ASPHALT IN GARDEN GROVE, CALIF.

"MAINTENANCE PRODUCTION TRIPLED...

...COSTS DECREASED 80%"

SEWARD H. DART, STREET MAINTENANCE SUPERINTENDENT-SHOWN WATCHING HIS 28" ESSICK VIBRATING COMPACTOR IN ACTION—STATES:

"Irrigation water tracked into the intersections and gutter aprons in Garden Grove, constantly eroded the asphalt and made maintenance a full time problem. As a result, our gutter and intersection patching required frequent reworking, and our costs were high.

"After a demonstration of the 28" Essick Vibrating Compactor, we knew we had found the answer. It was self-propelled, hooked on the tail gate of a dump truck, and produced compaction equivalent to an 8 ton roller on asphalt. Its high frequency vibration compacts an asphalt patch that is completely dense—that can be opened immediately to traffic without any marking or damage to the asphalt.

"Now with our patching unit consisting of the 1½ ton dump truck, an Essick 120 gallon Truck Mounted Emulsion Unit, a propane torch, and the Essick VR-28-W Vibrating Compactor, the patch life has been tremendously extended, our maintenance production has tripled, and our costs have decreased 80%.

"The Essick VR-28 really solved the patch problem for us."

SELF PROPELLED — MANEUVERABLE — PORTABLE

Essick High Frequency Vibrating Compactors are constantly exceeding the densities and specifications performed by other compaction methods, while creating new standards of compaction for all types of fills, sub base, base materials, and asphalt.

CALL YOUR ESSICK DEALER FOR A DEMONSTRATION

9 Models of Vibrating Compactors from 13" to 72" Widths

Also 14 models of Tandem Rollers from ½ to 14 Tons

ESSICK MANUFACTURING COMPANY

1950 Santa Fe Avenue, Los Angeles 21, California

850 Woodruff Lane, Elizabeth, New Jersey

Affiliated with THE T. L. SMITH COMPANY. Milwaukee, Wisconsin

by Chem Seal Corp. of Los Angeles and is designated as CS 2721 Hiway Stripe. The paint is being tested for color retention, resistance to abrasion, reflectivity, durability and other qualities.

A series of white, red and yellow stripes were painted on a heavily-traveled thoroughfare in the Los Angeles industrial area eight months ago. One half of each test stripe was laid on asphalt pavement and the other half on concrete. An estimated 18,000 vehicles, primarily trucks, have passed over the painted section daily—a total of more than 4,000,000 vehicles since the start of the test.

New Gradings for Gravel in Water Filters

When the City of Chicago Bureau of Water rebuilt Filter No. 31 in 1959, a new arrangement of gravel was used. Total gravel depth was 24 ins., arranged as follows:

	Gravel Size Inches	Thickness of Layer Inches
Bottom	1½ to 3½	4
Second	¾ to 1½	3
Third	½ to ¾	2
Fourth	¼ to ½	2
Fifth	⅛ to ¼	4
Sixth	¼ to ½	2
Seventh	½ to 1	2
Top	1 to 2	5

When Filter No. 61 was reconstructed in 1960, a different arrangement of layers was used giving a depth of 19 ins., as follows:

	Gravel Size Inches	Thickness of Layer Inches
Bottom	1 to 2	4
Second	½ to 1	2
Third	¼ to ½	2
Fourth	⅛ to ¼	4
Fifth	¼ to ½	2
Sixth	½ to 1	2
Top	1 to 2	5

In this arrangement only four sizes of gravel are used in the seven layers, which is an advantage. The largest size used, 1 to 2-inch, requires 9 ins. of total depth of which 5 ins. is at the top. The larger gravel is not readily shifted by jet action during washing. In the near future a smaller gravel, ½ to 1-inch, will be used for a top layer to determine by actual operation if this size is sufficient to prevent shifting during washing of the smaller gravel in the center of the bed. So far both of the rebuilt beds have worked satisfactorily, with no evidence of clogging in the gravel layers.

New Federal Driver Register

Secretary of Commerce Frederick H. Mueller has designated the Bureau of Public Roads, under the direction of Federal Highway Administrator Bertram D. Tallamy, to establish and maintain the Driver Register authorized by Congress in Public Law 86-660, which was recently approved. The Register will serve as a clearing house to identify for the states those motor-vehicle drivers whose licenses have been revoked because of driving while intoxicated or conviction of a traffic violation resulting in loss of life.

Because the program is an innovation, a great deal of exploratory work must be accomplished before the Register can become a working reality. Preliminary forecasts indicate that a pilot operation may be started in mid-1961, and the Register could be in full operation a few months later.

MORE HAUL!
NO STALL!
MORE THRIFT!
NO SHIFT!
MORE GUTS!
NO BUTS! (...IFS OR ANDS!)

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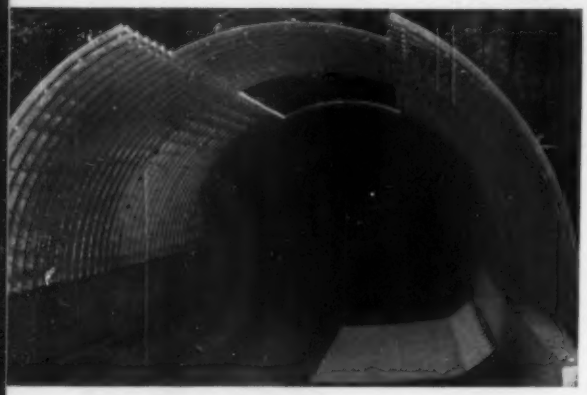
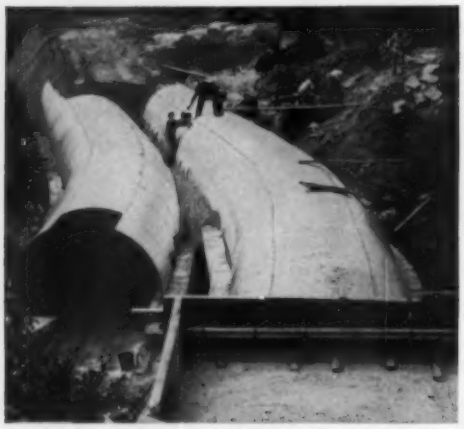
REPUBLIC SECTIONAL PLATE ARCHES HELP SOLVE STORM SEWER PROBLEM IN CLEVELAND



Close-up of one barrel of the storm sewer under construction, shows details of the structure.



Back-filling of the installation will be followed by landscaping to add to the beauty of the park.

An existing storm sewer located in southeastern Cleveland was being seriously overtaxed by runoff from an 800-acre area. Commercial buildings and homes located directly over the structure made enlargement impossible. Adding to the problem, the sewer emptied into an open stream running through Cranwood Park, thus hampering recreational activities.

Following a recommendation of the Regional Planning Commission, Cleveland's Engineering Department designed a second branch of the sewer to handle 390 acres of the area. The two branches intersect at the edge of the park, where they empty into a double barrel Republic Sectional Plate Arch structure.

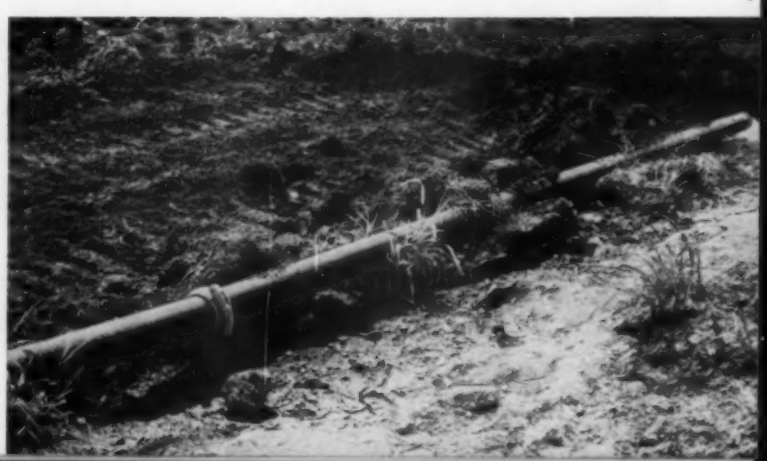
City Sewer Design Engineer, E. C. Richardson, noted that the type of sectional plate construction employed here has been successfully used in 12 major Cleveland projects. It has proved to be a most efficient and low-cost method for meeting a variety of different design and performance requirements.

THREE-WAY ECONOMY WITH REPUBLIC SECTIONAL PLATE CONSTUCTION

The true cost of a drainage structure includes cost of materials, assembly or labor costs, and life-of-the-structure cost. Republic Sectional Plate Construction gives you exceptional economy in all three areas: initial material costs that are well below the price of other types of drainage structures; simplified design features that eliminate the need for highly skilled labor and make for fast assembly; and the built-in reliability of resilient, galvanized, heavy gage steel.

Fast, easy-joining Republic ELECTRUNITE® GROOVED-END TUBING is a money-saving way to install temporary, semi-permanent, or permanent fluid, gas, and air lines. No threads to cut, fittings snap on to join sections tightly in seconds.

Strong, Modern, Dependable Steel



EACH BARREL of the double barrel installation has a 10′0″ span and a 5′2″ rise. The arch is made of 8 gage Republic Corrugated Sectional Plate. Concrete invert has a vitrified liner. Each barrel was designed for capacity of 812 C.F.S. The first installation of this design was constructed in 1934, and proved so effective that city engineers have used it in 11 other major projects.

Architects and Engineers—City of Cleveland, Engineering Division. Louis L. Drassler, Director of Public Service; J. R. Katz, Commissioner of Engineering; Clarence Lillig, Engineer in Charge of Construction; E. C. Richardson, Design Engineer; Square & Marra Construction Company, Bedford, Ohio, Contractor.

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DES MOINES, IOWA

The Des Moines Division of Public Works' new D6B works on gravel pit excavation, street construction and maintenance, and sanitary landfill—jobs that call for power and speed from a medium-sized crawler tractor. Heavy Equipment Supervisor John Porter, a 20-year veteran of Des Moines Public Works, says, "We recommended the Division buy a D6 because of two main reasons: we needed that size machine for its mobility, and we needed the dependability we always get from Caterpillar."

HOW TWO COMMUNITIES CUT COSTS WITH NEW CAT-BUILT MACHINES

GLENVILLE, N. Y.

The town of Glenville, New York, solved its nagging garbage and trash disposal problem with efficient, economical sanitary landfill. The town's 944 Traxcavator spreads, compacts and covers the refuse. Mr. L. O. Dunn, Town Councilman, states, "Economy and long life of our other Cat equipment were big factors in the selection of this machine. It has proved to be good for this job—and a versatile all-around loader in a one-man operation."

Your community or county, too, can save time and money with modern earthmoving or material handling equipment—and savings are even greater if it is Caterpillar-built. Tracks *or* wheels, important advances in power and operating ease team with traditional Caterpillar reliability and minimum maintenance requirements to squeeze extra work from your tax dollars. Consider, for example, advantages offered by the two machines shown here:

93 HP D6B Track-type Tractor 25% more lugging ability than former model. Adjustment-free fuel system permits use of economy-type, high-energy fuels. Dry-type air cleaner takes only five minutes to service. Forward-reverse lever saves time and effort in dozing and landfill work. Lifetime lubricated track rollers *never* need attention until rebuilding. Exclusive oil clutch delivers up to 2000 hours adjustment-free service. New hydraulic system (optional) with under-the-hood mounting of pump and tank frees front and rear of tractor for attachments, provides up to three hydraulic circuits. Matched tools for many jobs.

105 HP 944 Wheel-type Traxcavator More than seven years of testing have gone into this new excavator-loader. Choice of diesel or gasoline engine. Clean design for safe, convenient operation. Power Shift Transmission for fast response to load change. 41° bucket break out for heaped loads, stable design for smooth, safe operation, extra bucket reach to place loads fast, easily. Unit construction for easy servicing. Special attachments, buckets, including side dump, tailor machine to job. Roomy cab (optional) with large windows helps keep operator efficiency high. Two other sizes are available: 922—80 HP and 966—140 HP (only flywheel horsepowers listed).

Caterpillar Tractor Co., General Offices, Peoria, Ill., U.S.A.

Does your community have a refuse disposal problem? One answer is found in the new sanitary landfill movie, "A Decent Burial." It's informative, entertaining... ready to be presented by your Caterpillar Dealer. Call him today.

CATERPILLAR

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DEPENDABLE MACHINES GET THE JOBS DONE FIRST

Volume 92, No. 2 Public Works Magazine February, 1961

REJUVENATION OF A MAJOR WATER SYSTEM

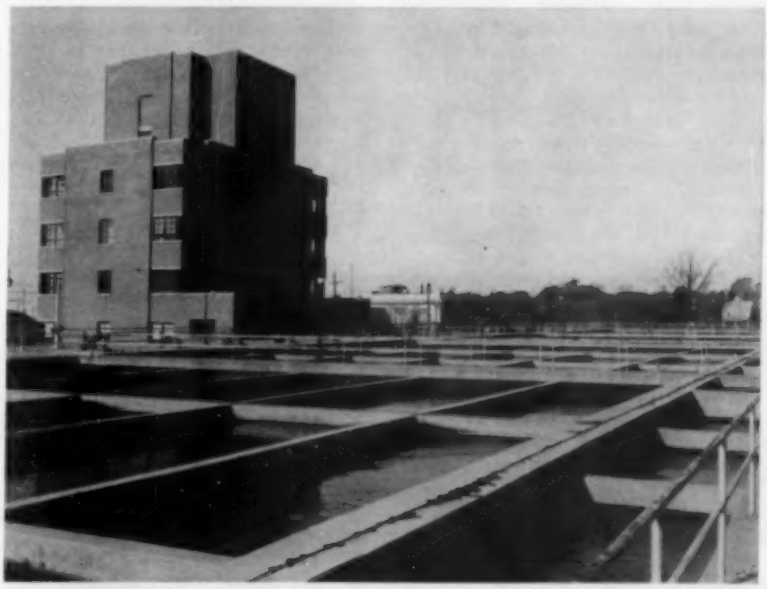
Philadelphia's 10-year master plan for modernization of its water system nears fulfillment, with completion of the new filter building for the Queen Lane Water Treatment Plant an outstanding accomplishment of 1960.

CLAYTON H. BILLINGS
Associate Editor

ANOTHER milestone has been reached in Philadelphia's ambitious water system modernization plan with the completion of the new filter building of the Queen Lane Water Treatment Plant. This achievement in 1960 is a part of a $123 million, 10-year program initiated shortly after organization of the City Water Department in its present form in 1951. Highlights have included the completely new $25 million Torresdale water treatment plant, placed in operation in 1959, and the load control center—a microwave communications network for monitoring the distribution system, also activated in 1960. By 1962, the City's third filter plant, Belmont, will have been remodeled to complete the modernization of water treatment facilities and bring the output capacity to an average 486 mgd, with a potential maximum of 678 mgd.

Associated improvements have been replacement of pumps at raw water and distribution system stations, some of which were still steam driven in 1950; and replacement or rehabilitation of mains.

A curious facet of the program is that the increase in treatment capacity achieved, 80 mgd average, is not impressive, considering the national trend of increasing per capita use. Yet it is believed to be adequate. One reason is that a universal metering project was started in 1952 and it has probably affected water consumption. In 1949, the total number of services was 472,792, with 217,507 unmetered. In 1959, the unmetered accounts dropped to 9,558 of a 513,660 total. Actually, only 4,000 properties had not received meters by the end of 1959 and these were mostly vacant or awaiting reconstruction. Present average consumption is 343.5 mgd; in 1949 it was 351.2 mgd. Other factors have had their effect; There has been a decrease in urban population within the city limits, which is considered to be temporary. Extensive urban redevelopment taking place now is expected to increase Philadelphia's population and industry in future years. The modernization of the water system which will improve the quality of the water available, as well as the quantity, will probably attract new industry and induce



● **AT PRETREATMENT building (rear), alum, lime and chlorine are applied. Basins for slow mixing are in foreground; covered rapid-mix basins are alongside building.**

● **SEMI-AUTOMATIC** controls permit the operator to wash the filter beds very quickly.

● **PUSH-BUTTON** control tables, one for each filter, line the two long galleries in the new filter building. Control is either manual or semi-automatic.

those now using river water directly to switch to the city system. With the metering program completed and the other influences taking effect, the city's water consumption should increase in line with the national trend in future years.

History

Thus waterworks history is again being made in Philadelphia. In 1801 it was the site of the country's first steam-powered pumping plant. It was one of the cities in which the unique concept of double filtration was explored and adopted. The first permanent liquid chlorine feed arrangement was established at the old Torresdale plant in 1913.

Ozone treatment of filtered water was tried at the Upper Roxborough plant in 1941, and was used for precoagulation treatment at Belmont until May, 1955. In 1954, Philadelphia became the first multimillion population city in this country to employ fluoridation.

Ever since the city has had a public water supply, it has relied principally on one or both of the two rivers that reach their confluence within its boundaries, the Schuylkill and the Delaware. At first, the water was pumped without treatment except for prolonged periods of sedimentation. Slow sand filter plants were built at Roxborough, Belmont, Queen Lane and Torresdale. "Prefilters" to effect double filtration were later added at all stations. At Queen Lane in 1923, after addition of coagulation basins, one-half the prefilters were converted to conventional rapid sand filters. A 36-mgd coagulation—rapid sand filter plant was built at Belmont to supplement the 18 slow sand filters.

Much of the experimentation was occasioned by growing concern over the pollution load in the rivers and by tastes and odors resulting from industrial wastes. The use of activated carbon, chlorine dioxide and free chlorine residual treatment were also employed with success.

The relief that was most significant, however, was the clean-up of the river pollution by efforts of state and interstate agencies as well as the city itself. The City's role is significant since it has accepted into its interceptor system sewage from outlying communities which would normally have to use the Delaware Basin rivers as wasteways.

The Queen Lane Plant Modernization

Doing away with the slow sand filters is a primary objective of the treatment plant rehabilitation phase of the program. This has been done at Torresdale and Queen Lane and will be started at Belmont in 1961. The Roxborough plant will be taken out of service after the Belmont project has been completed in 1962. The space required for the old filters and the manpower needed to wash and maintain them has made them too expensive to keep.

Associated with the substitution of conventional rapid sand filters are other improvements such as providing coagulation and flocculation facilities, modern chemical handling and feeding equipment and advanced instrumentation at all plants. Near automation is the aim of the Water Department to minimize manpower requirements.

At Queen Lane the rehabilitation program has covered several years, beginning with installation of a pretreatment building in 1955 and improvements to the coagulation facilities. Chemical handling and feed equipment were installed, equipped with controls to allow automatic regulation of feed with water flow through the plant. Omega belt-type gravimetric dry feeders are employed for alum and lime.

The next step was rebuilding the raw water pumping station, and this was completed in 1959 with the installation of a new intake with bar screens, a gantry crane and a trash conveyor. This pumping station discharges to one of the old plain sedimentation basins where alum and lime can be added if high turbidities require. Silt was removed from this basin by dewatering it and using a 36-inch conveyor, 640 ft. long. A total of 247,000 cu. yds. of silt was removed at the rate of 200 cu. yds. per hour.

The new filters were built at the site of the old rapid sand filters. A total of 40 units were installed, 1,000 sq. ft. each, providing a total capacity of 120 mgd at 2 gpm per sq. ft. The old rapid sand filters were completely torn down and reconstructed in the process. The slow sand filters have been taken out of service and will later be converted to filtered water storage.

The new filters are equipped with Leopold compound duplex filter bottoms of salt glazed vitrified fire clay. The sand is 28 inches deep with an effective size range of 0.48 to 0.55 mm. and a uniformity coefficient of 1.31 to 1.46. The gravel layer consists of two inches of torpedo sand with a maximum size of 1/32 in.; two inches of gravel ¼ to ⅛ in.; two inches, ¼ to ½ in.; and four inches, 1 to ½ in. Wash water troughs of 3-in. reinforced concrete poured in place using metal forms are provided with adjustable aluminum weir plates. The amount of freeboard from the sand surface to the weir plates is 31 inches. Palmer surface agitators of

the self propelling rotary type are used, operating under 85 psi. There are six of these in each of the 40 beds. The diameter of the sweep is 12½ ft.

As reconstructed, the plant provides preliminary sedimentation in the original 177-MG basin. Chlorine is added at this point to produce a free chlorine residual. At the design filter capacity, a retention period of two days is available in this basin. The flow through the plant is by gravity with a 6-ft. differential between operating levels in the preliminary sedimentation basin and the clear well. Rapid mix, with addition of alum, lime, chlorine and carbon is provided in the pretreatment building. This is followed by a 45-minute flocculation period. The water then flows through perforated baffle walls to sedimentation basins with a 3¼-hr. retention period. After filtration, the free chlorine residual is restored by additional chlorination and fluorides are applied in the form of fluosilicic acid.

Sequence Control of Filter Backwashing

To simplify operations and to reduce operating expenses the forty rapid sand filters at Queen Lane are equipped with the "Auto-Central" automatic backwashing system of B-I-F Industries. This is a sequential type system of electrical circuits, with built-in self-checking features, which require completion of one step before the next operating step can occur. The filters are equipped with butterfly and gate valves with electric operators; additional limit switches are provided in the electric operators for keying the relays and timers in each filter console. Consequently the control system in this plant is primarily electrical to tie in readily with the electrically operated filter valves.

The backwashing sequence of the "Auto Central" system is initiated manually when the head loss in a filter exceeds a predetermined amount. The operator is warned by a bell, and a visual alarm signal on the appropriate filter console indicates which filter is affected. The alarm bell can be silenced by depressing a button on any console, but the alarm light on the console of the filter requiring washing will remain on until the operator initiates the wash cycle by pressing a button on the filter console. From this point, the wash program is completely automatic; the filter is washed and returned to service without further attention. The influent valve is closed, allowing the level of the water in the filter box to reach a predetermined level causing the closing of the effluent valve. After complete closure of the effluent valve the drain valve opens. When this action is completed a valve is opened which starts the cycle. After a period of time the main wash valve opens and initial backwashing takes place before surface washing is completed. Surface washing ceases and backwashing is continued at a controlled rate for a predetermined length of time. Thirty seconds before backwashing is stopped, a light on the console warns the operator that backwashing will end. The console is equipped with a manual over-riding control which will permit backwashing to continue for any length of time desired. Complete closure of the wash valve initiates closing of the drain valve. The closing of the drain valve opens the influent valve admitting settled water into the filter. When the level of water in the filter reaches a predetermined stage the effluent valve is opened and the effluent controller starting from a closed position increases the filter rate gradually until the preset filter rate is reached.

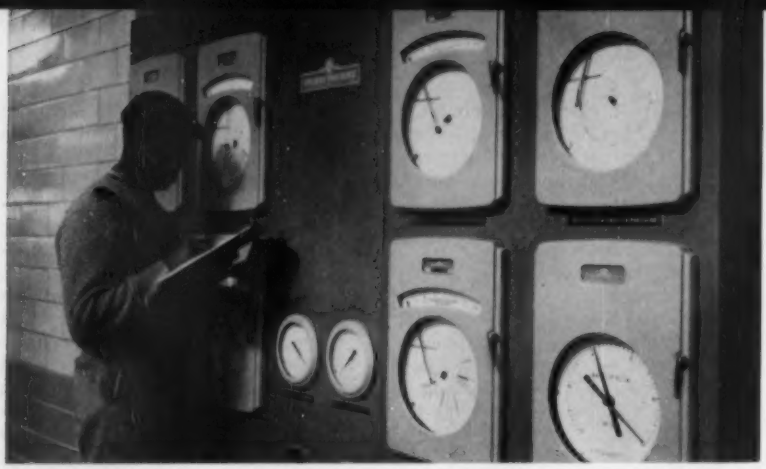
The system is designed so that two filters may be washed automatically at the same time, with the wash water controllers automatically doubling the wash rate when this occurs.

Even though the system completely automates the backwashing process, it permits operating flexibility. The duration of surface wash, the overlap between surface wash and backwash and the duration and rate of backwash can be readily changed. All filters may be washed manually using selector switches on the filter consoles. Due to wash water quantity limitations not more than two filters can be washed at the same time and interlocks are provided to prevent this. However the two being washed may both be under automatic control or either or both under manual control. A reset button on the console allows the operator to stop the wash cycle at any point and return the filter to normal filtering operation. Washwater is supplied through two 36-inch controllers and these are designed to double their output if one controller is out of service.

Master Control Panel

The master control panel is designed for monitoring and controlling the filter rates by arbitrarily selecting a maximum rate or by allowing the rate to be governed by

● **FOUR AUTOMATIC** *dissolved oxygen analyzers and recorders take water from the Delaware River for quick information on changing conditions. At the right is S. S. Baxter, Water Commissioner; at left, J. V. Radziul, research and development engr.*



● MASTER CONTROL panel in the filter building permits operator to note rate of flow through filters and to regulate washing which must be started at the console.

clear well or preliminary sedimentation basin levels. The principal instruments are:

1) Pnuematic totalizer-indicator-recorder for total wash water flow equipped with a fast moving chart which runs only during actual flow periods, receiving a pneumatic signal from a two-unit summator which totals the flow through the two 36-in. wash water controllers;

2) Two pneumatic double pointer indicators, one each for the north and south filter galleries, which indicate the master rate for which the effluent controller in each gallery is set and the maximum or limiting rate which the controllers cannot exceed;

3) A pneumatic 2-pen recorder to log the levels in the north and south clearwells;

4) A telemetering indicator-recorder to monitor the wash water tank level, including switches for controlling the wash water tank filling pumps;

5) A pressure-actuated 2-pen recorder for the 30 and 36-in. high service lines;

6) An electrically actuated totalizer - indicator - recorder which measures flow of surface wash water to the filters;

7) Two indicators to show the backwash set rate; one shows the single filter wash rate; the other indicates the set rate for two filters being washed at the same time.

The pneumatic selector switches, rate setters and other panel mounted components provide the following operation: The plant is divided into two galleries designated north and south, with 20 filters in each gallery. The filtering rate of all filters in each gallery may be set automatically by a pneumatic transmitter measuring the water level in the influent flume, or automatically by the level of the north or south clearwell or manually by master manual control. The master control systems are equipped with a maximum rate limiting arrangement to establish a filter rate which cannot be exceeded regardless of the master rate setting used. If the plant is on influent level control, the clearwell level control will supersede it when the clearwell level is high, thus gradually closing the effluent controllers when the clearwell is full. A drop in the clearwell level will return the effluent controllers to influent level control. Each individual console is equipped with a selector switch allowing that filter to be removed from master control and placed on local control, with the effluent rate established with a rate setter and indicator in the console.

The consultant for reconstruction of the filters at Queen Lane was Morris A. Knowles, Inc.; Architect, Walter A. Antrim. Among the principal contractors, the filters were built by Laub Construction Co. with filter equipment and piping handled by Roberts Filter Equipment Mfg. Co. which subcontracted with B-I-F Industries for instrumentation; the high voltage grouped control assembly was provided by Westinghouse Electric Corp.

Quality Control

All plants are equipped with modern laboratories, each under the direction of a sanitary chemist who is also responsible for control of treatment processes at the plant. Further responsibilities are pollution abatement control programs on the watersheds, the detection and correction of water quality problems in the distribution system and research in water treatment. The watershed is patrolled by automobile and the Delaware by boat for sampling purposes.

A recent innovation is the installation of a robot monitoring program on the Delaware, whereby samples are collected and analyzed automatically for dissolved oxygen and specific conductance. This is done at the Torresdale plant and two other points. The DO analyzer and recorder, which records temperature also, is manufactured by the Hays Corporation. At one of the stations, Municipal Pier 11 North, a circular chart recorder made by Industrial Instruments Co. is used for specific conductance. At Torresdale and the other point, Marcus Hook, a Brown Electronic Instrument Y-15 has been adapted by the Industrial Instruments Co. for recording specific conductance by strip chart. A Hays four-pen multiple recorder has been installed at Trenton to monitor specific conductance, pH, temperature and turbidity.

Monitoring the Delaware from boats has been carried on jointly by the Water Department and the U. S. Geological Survey since 1949, but dissolved oxygen has been determined by manual laboratory procedures. A portable dissolved oxygen recorder is on order which will improve the efficiency of the midstream monitoring. Portable equipment is now in use on boats for determining and recording specific conductance and temperature. This recorder is made by Jarrell Ash Co.

It is anticipated that the automatic monitors will be tied in with the microwave transmission system of the load center so that key personnel can be kept continually informed of river conditions. Radioactivity monitoring on the two rivers has been handled since 1957 by making gross counts on periodically collected samples. The City expects soon to install continuous automatic radioactivity monitors to supplement this program. Consideration is also being given to monitoring sunlight distribution by photo cells as a means of anticipating algae growth.

The raw Schuylkill River water in 1959 varied in turbidity from 23 to 129 with an average of 50. Other average values in 1959 were color, 22; total solids, 255 mg/L; total hardness 144 mg/L; iron 1.4 mg/L; manganese 0.41 mg/L; and pH 7.4. Coliform MPN values ranged from 22,000 to 210,000 per 100 ml., with a mean of 79,000. No attempt is made to soften the water, but by treatment at Queen Lane in 1959, turbidity, iron, manganese and coliform MPN were reduced to negligible figures.

The Delaware raw water quality is better from the standpoint of chemical constituents but had a higher mean coliform MPN in 1959, 87,000 per 100 ml. The hardness is much lower, averaging 64 mg/L.

ELECTRONIC CONTROL OF TRAFFIC SIGNALS

ELECTRONIC control of New York's traffic signals by means of a radio communications system is now undergoing an intensive one-year test. The system, which is designed to reduce traffic delays by providing centralized signal control and synchronization and greater operational flexibility started operations on a heavily-travelled four-mile stretch of Conduit Boulevard in Queens. This service road of the Belt Parkway handles 60,000 vehicles daily. Later installations are being made at various locations throughout the city to determine feasibility of the control system under different conditions.

Changes in signal timing at the vast majority of the city's 8,000 signalized intersections are presently made by individual adjustments at each control box thereby making programmed or instantaneous emergency changes impractical. Signal interconnection, to permit timing schedule maintenance and synchronization of staggered light systems, has up to now been made by laying cable between each signal. This is an expensive method and causes disruption of traffic as a result of excavating the cable trench. The cost of installing the cable system is approximately $50,000 per mile. The radio system will reduce this figure to about $15,000 per mile and make it unnecessary to dig up the streets.

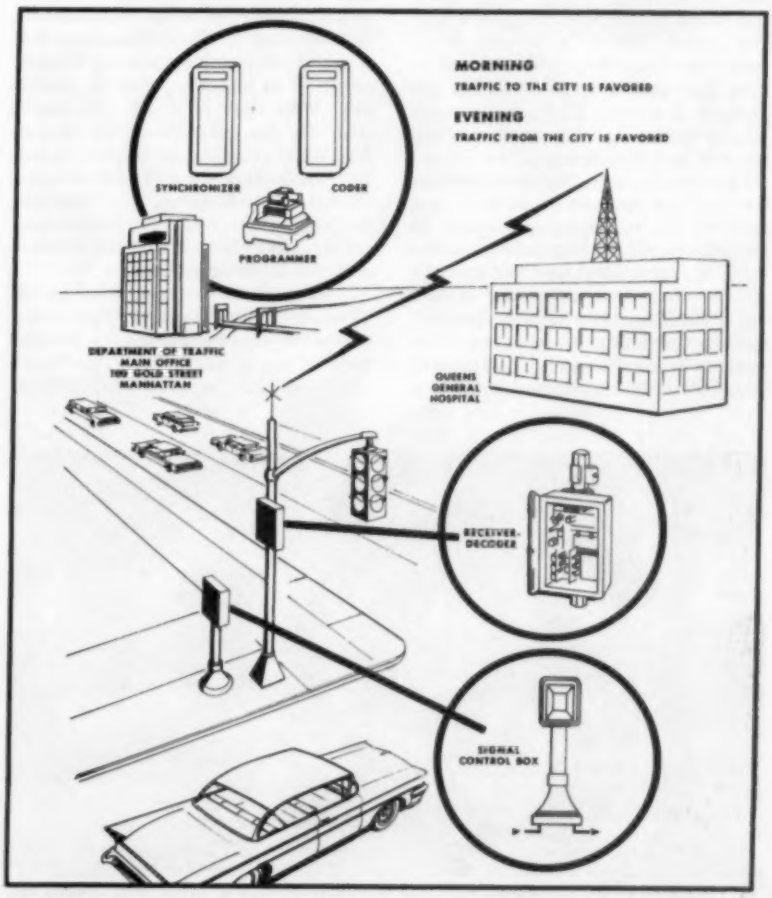
Under the new system, the central controller can put 18 different types of programs or schedules into effect, each within an interval of not more than 12 seconds, by means of a punch-card reading device. This is the first such punch card control system ever installed. The cards, representing a "program" for a particular street system, are fed into equipment which translates the pattern of perforations into coded electronic impulses. Routed by telephone cable to an unattended FM radio transmitter on the roof of the Queens General Hospital, the impulses are broadcast as ultra high frequency signals. At a street intersection the receiver - decoder, mounted on the signal pole, controls the traffic light according to the instructions received. It responds only to broadcast signals coded for the particular location. Each card in a "program" controls one or more traffic signals. Punching on the cards represents both the location of the signal and the predetermined instructions for the functioning of the light.

The entire Traffic Control System has been designed on a fail-safe basis. A cessation of synchronizing pulses will not stop remote dial operation; dials will continue to operate in a free-running status. A fault resulting in loss of program change tone pulse will result in no program change; in this case, the functions previously selected in the controller remain in operation because the magnetic-latching relays will hold their last order positions until the correct combination of tone codes are received.

A system of lights may have several "programs" keyed to changes in traffic flow characteristics at different hours of the day. Thus, heavy inbound traffic may be favored in the morning and heavy outbound in the evening. Changes in the character of vehicular flow, such as that occurring in midtown Manhattan where the heaviest direction of traffic is north-south during the day and after 7 PM, east-west, can also be accommodated by the system.

The citywide plan envisions a transmitter station in each borough which will receive messages from the master controller to be located at traffic department headquarters in Manhattan. FM station KEH-307 has been assigned by the FCC to the department for broadcasting the coded signal control instructions. Electronic equipment installed at the headquarters can control 1,000 separate locations. It also has means for manually interrupting or resetting a "program." Simultaneously with control instructions the system broadcasts keep traffic signals operating in proper sequence.

The radio control system was built by Motorola Communications and Electronics, Inc., Chicago, Ill. according to traffic department specifications at a cost of $125,699.



● **DIAGRAM shows how the traffic control program is applied to a particular street.**

USE OF SOIL CEMENT CUTS STREET COSTS

FRANK FORCE,

Manager-Engineer,
Borough of Hellertown, Pa.

THE USE of soil-cement cut street construction costs by 22 cents a square yard in Hellertown, Penna. The cost of the soil-cement was $1.68/sq. yd. compared to $1.90/sq. yd. for the 6-in. base slag-type construction.

Collins and Maxwell of Easton, Penna., was awarded the contract for the 10,000-sq. yd., 6-in. soil-cement street project. The section constructed was on Front St., from Water St. to Walnut St., a distance of 2500 lin. ft. The street is 40 ft. wide from face to face of curbs.

The curb, which is paid for by the property owners, is 6-in. wide at the top, 8-in. wide at the bottom and 18-in. deep, with a 6-in. face. The price of the curb was $2.00 plf. The gutter, 30-in. wide and 6-in. deep, cost 75 cents psf. The concrete curb and gutter were installed by Francis Lancner, Bethlehem, successful bidder for this type of work for the last eleven years.

The specifications for the concrete for the curb and gutter were: 1:2:3 mix, 6 gal. of water per sack of cement maximum including moisture in aggregate and slump not greater than 4-in. using the standard cone. The concrete was finished with a wood float to an even contour with no plastering permitted. One-half-inch expansion joints were required at all places where the curbs abut walks or other rigid structures and at places designated by the engineer.

● **MOBILE laboratory operated by the contractor provided controls for the work.**

The specifications for the street base and wearing surface provided that the base be 6-in. soil-cement. The wearing surface consisted of a penetration of 0.25 gal./sq. yd. with cover of 25 lbs./sq. yd. of 1B stone and 0.35 gal./sq. yd. of seal, with 20 lbs./sq. yd. of 1B stone. A 2-year warranty on the construction was furnished by the contractor. The $1.68/sq. yd. included bringing the street to grade and constructing the soil-cement base and the wearing surface.

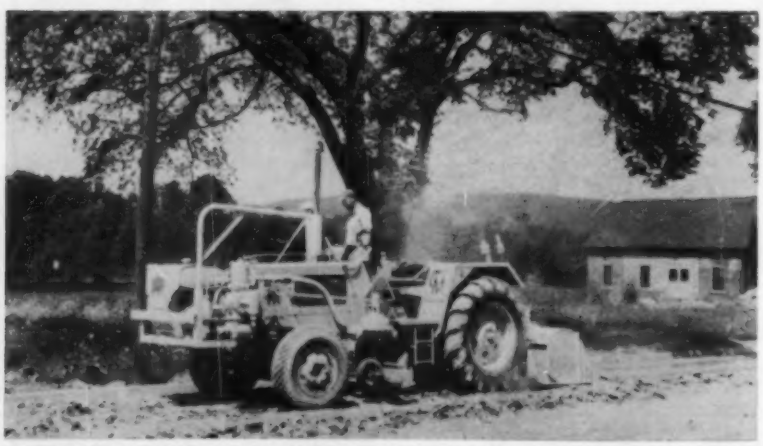
Two catch-basins connected by an 18-in. reinforced concrete pipe storm sewer were constructed to handle part of the storm water. The 18-in. storm sewer was extended 160 ft. across private property to a drainage ditch. Most of the storm water is carried on the street surface. The concrete pipe was purchased from the Lock Joint Pipe Co.

The Hellertown Borough Water and Sewer Authority located all manholes and water valves and brought them to the proper grade. United Gas Improvement Co. replaced and relocated all gas valves. Pennsylvania Power and Light and the Bell Telephone Co. relocated all poles that were in the construction area.

Base Construction

Collins and Maxwell used a 2½-yd. Michigan loader with teeth on the bucket to do the initial ripping and scarifying; also, a Caterpillar grader with ripping teeth was used for rough grading. All large stones were removed from the roadway and placed at the curbs. An International industrial tractor equipped with a loading bucket was used to load the stone to be hauled away.

Approximately 1000 cu. yds. of dirt were needed to bring the street to final grade, fill being needed in some places to a depth of 2 ft. Six 4-yd. dump trucks were used in the 1½-mile haul to bring in the fill, the Michigan loader being used to load the trucks. A Caterpillar D-7 tractor-dozer and the Caterpillar grader were used to level off and to grade. A Huber-Warco 10-ton 3-wheel roller was used for compacting the soil. The soil used as fill was of granular texture and blended well with the existing soil to provide a balanced mixture for soil-cement. By laboratory tests it was found that the average cement require-



● **SOIL-CEMENT construction followed the usual pattern of shaping, spreading the cement, scarifying and mixing with a Pulvi-Mixer, followed final compaction.**

● THIS IS what Front St. looked like before work began. Contract involved constructing 10,000 sq. yds. of surface.

● AFTER the work was completed, the Borough had a street 40 ft. wide, with bituminous surface on soil-concrete base.

ment for the mixture was 10 percent by volume or 44 lbs. psy. The contractor furnished a complete laboratory in the field to perform the tests needed in the soil-cement construction.

After the street was bladed to crown and grade, the dry cement was spread by a rubber-tired Hercules bulk spreader. A White truck, equipped with a 100-barrel auger-type cement tank and an International-Harvester dump truck, were used to fill the spreader with cement. The body of the dump truck was covered to prevent the cement from blowing and to keep out foreign materials. Hand spreading of the cement was required at intersections and hard-to-get-at places.

The bulk cement was delivered to the job by 100-barrel air slide trucks. Approximately 1325 barrels of Type I cement, bought from the Alpha Cement Co., were used on the job.

The Caterpillar grader was used to scarify the ground to a 6-in. depth to mix the cement and to break the ground for the Pulvi-mixer. Again a crew of men followed the grader to dispose of all stones 3 in. in diameter or greater.

Next came the pulverizing by the American - Marietta Pulvi - mixer. Several passes were made to get the full 6-in. depth thoroughly mixed. The blade of the grader was used to mix along the edge of the gutter. Next step in the operation was the addition of water to bring the mixture to optimum moisture. The correct water content of the mixture was carefully watched. Two 1000-gal. water trucks were used to apply the water.

The final mixing of the soil, cement and water by the Pulvi-mixer was followed by compaction with a sheepsfoot roller pulled by a D-6 Caterpillar tractor. An American-Marietta 20-ton rubber-tired roller was also used along with the sheepsfoot. The grader was used to make the final crown and grade and final compaction was accomplished by the 10-ton roller.

● CURB IS under construction and excavation is being made for the gutter. The curb is 6-inch, 18 inches deep; the gutter is 30 inches wide and 6 inches thick.

Wearing Surface

The wearing surface was then applied. Over a penetration of 0.25 gal./sq. yd. of C-1 asphalt, applied by distributor, a covering of 25 lbs./sq. yd. of Pennsylvania 1B stone was placed by a truck spreader. A seal of 0.35 gal./sq. yd. of C-1 asphalt was applied by distributor with a covering of 20 lbs./sq. yd. of 1B stone as a final topping. The asphalt was purchased from Frank Hausman, Allentown, and the 1B stone from the Bethlehem Steel Co. A broom pulled by a truck was used to level the stone and the rubber-tired and steel wheel rollers were used to compact the stone. Final cleanup of the project was done by the contractor.

The property owners in Hellertown are billed for the curb and gutter installed after the job is completed. The property owners also pay for a warrant of survey which covers the line and grade of the curb. The charge for this is $15 for the first 50 ft. and 20¢ for each additional foot. If payments are not made in the six-month period allowed, a lien is filed against their property.

The Manager-Engineer performed the survey, design, field layout and inspection during the construction. Ted Boam was the contractor's superintendent on the job and Robert Kling represented the Portland Cement Association.

Turnpike Sewage Treatment DATA Will Aid Designers

R. H. FINN
Superintendent of Buildings,
Ohio Turnpike Commission,
Berea, Ohio

THE OHIO Turnpike, running east and west and connecting the toll highways of Indiana and Pennsylvania, provides an excellent four-lane divided highway for rapid travel across the heavily populated portion of Ohio. Rest stops as well as facilities for providing full-course meals to patrons were constructed along the Turnpike, resulting in sixteen service plazas providing restaurant service, service station facilities and restrooms. These service plazas are built in pairs across the road from each other at approximately thirty-mile intervals.

The sewage flow from these facilities is high in grease content from the cooking operations. The loads discharged are varied according to the season, the day of the week and hour of the day, and with the travel fluctuation.

Service plazas for the most part were not constructed on year-around flowing streams; therefore the sewage treatment facilities had to be very efficient. It was decided to provide a two-stage trickling filter operation, the filters operating in series with two Dorr-Oliver Clarigesters operating in parallel.

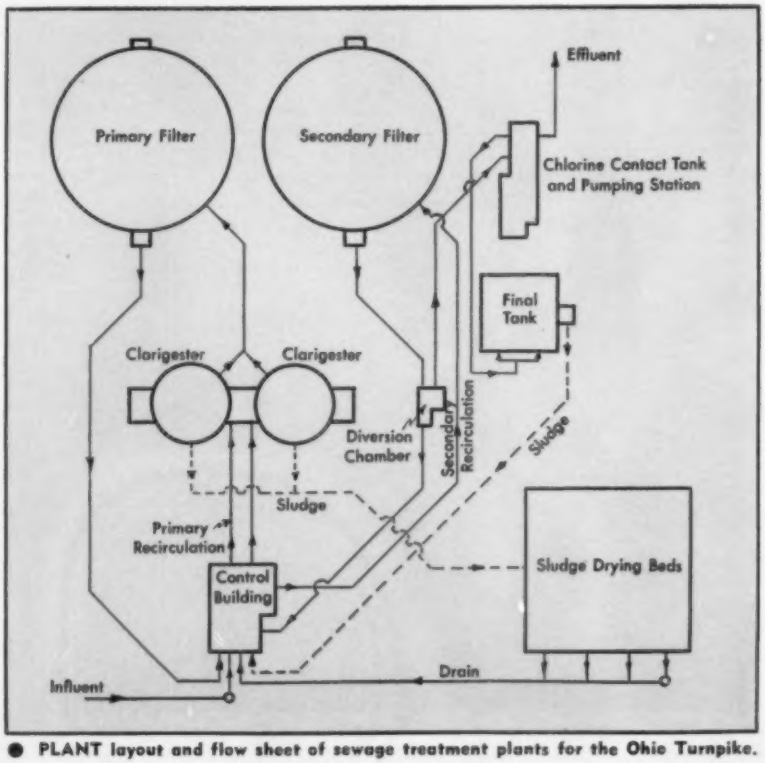
Eight plants were constructed to serve the 16 plazas. Raw sewage is pumped to the Clarigesters, from which it flows to the primary trickling filter and then returns to the primary recirculation wet well in the control building. A continuously-operating 100 gpm pump (equal in capacity to the design raw sewage flow) operates from this wet well, discharging to the Clarigesters. The portion of the return flow from the primary filter, which cannot be handled by the 100 gpm pump discharges into the secondary recirculation wet well, adjacent to the primary recirculation wet well. Pumps operating from this wet well discharge to the secondary filter. A portion of the effluent from the secondary filter returns to the secondary recirculation wet well, with an amount equal to the raw sewage flow overflowing to the final sedimentation tank.

Under average flow conditions, recirculation equal to the raw sewage flow discharges to the filters and to the Clarigesters. During low flow conditions, the primary recirculation is used to prevent septic conditions in the Clarigesters. This is particularly useful because of the unique design feature allowing as an alternative arrangement, the directing of raw sewage inflow to the sludge compartment of the Clarigesters, so that it flows upward into the settling chambers. This provides pre-digestion of the grease and eliminates much of the grease floating to the surface. This idea has worked out well in practice, and to date most of the plants are discharging the waste into the digestion portion of the tank. The plants which are discharging into the settling portion of the tank have more grease to remove requiring more operation attention. The grease which does float on the Clarigesters is raked by means of the skimmer arm into baskets and is then pumped into the digester portion.

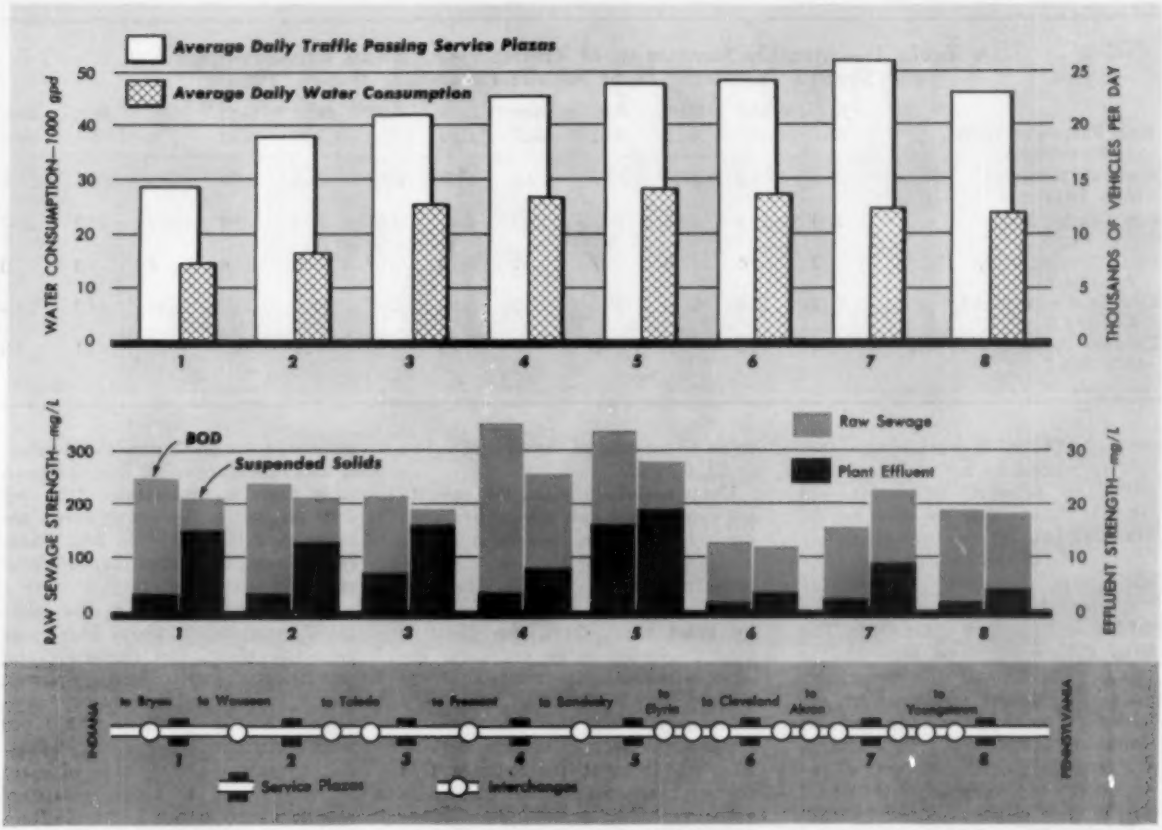
The design loadings on the 48-ft. trickling filters are 1½ lbs. BOD per cubic yard on the primary and 0.39 lbs. BOD per cubic yard on the secondary.

Supervision

Overall supervision of these plants is retained by the Ohio Turnpike Commission, but only the three plants on the eastern end of the



● **PLANT layout and flow sheet of sewage treatment plants for the Ohio Turnpike.**



● **WATER CONSUMPTION,** *traffic volume and operating results averaged for the year 1959 for the eight sewage treatment plants at service plazas on the Ohio Turnpike. It is interesting to compare results at plants 1, 2 and 3, operated by Concessionaire A, and plants 4 and 5, operated by Concessionaire B, with results at plants 6, 7 and 8, which were operated by Turnpike maintenance personnel. Approximate location of each facility is indicated at bottom of chart.*

Turnpike are operated by Commission personnel. The remainder are the responsibility of the concessionaires. Each individual plant is provided technical supervision and sample analysis by a nearby certified sewage plant operator.

The results of these analyses are submitted as required to the Ohio State Department of Health once each month. Specifically the tests are for suspended solids, and BOD on the raw sewage and final effluent, done by the technical supervisors, and settleable solids on the raw and final and relative stability and chlorine residual tests on the final, run by the plant operators. The results of these analyses indicate that the plants are achieving a high percent of removal of both BOD and suspended solids, therefore fulfilling the obligation of discharging a stable effluent into the final receiving stream or ditch as the case may be.

Operating Attention

The plant operators spend about two to four hours a day at these plants on normal operation duties. In cases of routine maintenance such as painting, pump overhaul and other such items, more time is required, and technicians help with these tasks. We have found that a continuous painting program is required as most of the units are exposed to the weather and destructive fumes from the sewage. The Clarigesters, filters and final settling tanks are covered to lessen odors, and for safety reasons. This complicates the maintenance problem as condensation gathers rapidly in an enclosed unit and is destructive to the metal surfaces. The covers on the Clarigesters are plywood with openings provided for observing the tank surface, skimmer, etc. The primary and secondary filters are equipped with concrete dome-type covers with provisions for air to circulate through the sides and out the top.

The final tank sludge drawoff valve is left lowered just enough to allow a small volume of overflow to run back to the raw wet well. The final clarifier sludge which is drawn once a day flows by gravity to the raw well to be pumped to the Clarigesters.

These plants are provided with facilities for pre and post-chlorination; however, the post-chlorination only has been used to this date.

While we normally require analyses on only the raw and final effluents at the plants, it is very helpful to have analyses of samples collected between the various units to indicate the efficiencies obtained from these units. We ran two special tests recently, one during the winter when traffic and resultant loading on the plant was low and one during Memorial Day weekend when traffic was rather high with a resulting higher loading on the sewage treatment plant. The result of the winter special test showed a high reduction of BOD and suspended solids from the raw to the settled effluent. This is accounted for mainly by the fact that a high percentage of the Clarigester influent was filter effluent.

The raw to primary filter effluent suspended solids reduction was 93

Table 1 — Monthly Summation of Traffic Flow, Water Consumption and Sewage Treatment Plant Results for Service Plazas, 1959

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
Total Passenger Traffic, 1,000 vehicles	461	457	623	661	817	1,018	1,254	1,333	954	794	691	622
Water Consumption, Avg. 1,000 gpd	25.9	28.5	30.4	33.7	38.1	51.1	66.9	75.3	57.4	42.5	35.7	33.1
Raw Sewage BOD, Avg. mg/L	174	196	245	301	235	249	267	203	258	247	199	234
Final Effluent BOD, Avg. mg/L	7	4	5	7	4	10	7	5	4	4	3	3
Raw Sewage Suspended Solids, Avg. mg/L	211	214	228	195	205	190	261	200	216	248	192	203
Effluent Suspended Solids, Avg. mg/L	10	10	9	8	12	13	12	11	13	10	11	15

percent (182 to 13 mg/L) while the raw to secondary filter effluent was only 1½ percent higher (to 10 mg/L). During this low-flow period the plant loading was approximately one-fourth of design capacity (37,000 gpd); therefore most of the treatment had taken place in the settled and primary filter units. The BOD values increased between the primary filter and the secondary filter (9 to 16 mg/L); however, we felt this possibly was caused by sloughing, continuously occurring in the secondary filter. The overall reductions were very high (140 to 1 mg/L).

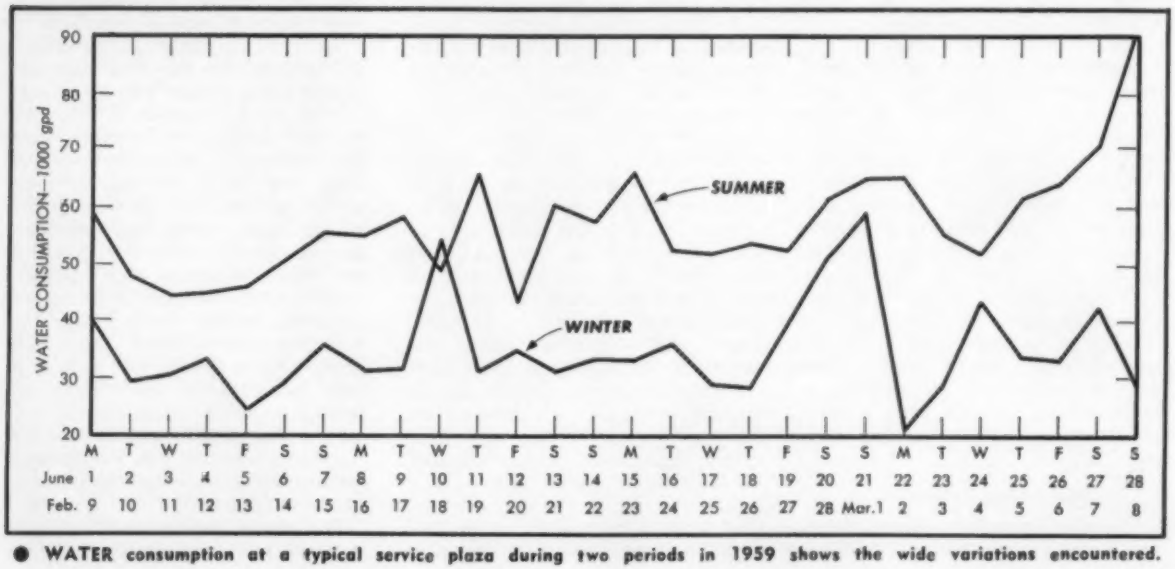
In the Memorial Day weekend tests, a similarly high reduction in BOD and suspended solids was demonstrated in the Clarigester (228 to 10 mg/L and 184 to 46 mg/L, respectively), but the suspended solids increased through the secondary filter (28 to 44 mg/L). However overall reduction was high (to 5 mg/L suspended solids and to 2 for BOD). The flow was estimated to be 40 percent of the design figure or 52,000 gpd.

Upon occasions when the operating cycle of the raw pumps has been upset by lightning storms or power outages, raw sewage has accumulated in the raw wet well. When the raw pump is put back in operation by reset mechanism, the plant is then subjected to an overload. We have noted at these times that the effluent from the plants is still very clear despite the fact that some of the intermediate units appear to be affected. It is at these times that the secondary filter demonstrates its value by taking care of these overloads.

There are no flow meters at the sewage treatment plants, but we have taken water usage tests at one water treatment plant to determine pump operating time. As a result of the tests, we have determined the volumetric loading on the treatment plant in terms of water consumption rates. As would be expected, the high flows are generally experienced from Friday to Monday. It was also discovered that the peak daily flows occur between 2:00 and 4:00 pm, while the lowest flows are between 2:00 and 7:00 am. These restaurants, of course, are 24-hour operated units.

The cost of supervision and labor (1957 estimate) is about $4,500 per year per plant. For materials and service such as chlorine, power, grease, paint and laboratory supplies, the cost is about $2,300 per year per plant.

It appears that this type of plant is well suited to treat restaurant wastes where grease and wide fluctuations in flow are experienced. The two-stage filters seem to operate very well under all load conditions and particularly well when shock or overload conditions are experienced. The overall efficiencies compare with activated sludge plants but do not have the foaming problem, particularly experienced with high detergent-content water discharged from restaurants.



● WATER consumption at a typical service plaza during two periods in 1959 shows the wide variations encountered.

"ACCEPTED PRACTICE"

IN MUNICIPAL STORM DRAINAGE DESIGN

C. S. SEABROOK
City Engineer,
Puyallup, Washington

NOT LONG AGO an engineer with whom the writer was discussing a certain problem almost precipitated a landslide by commenting, "But this is *accepted practice.*" The remark was a perfectly innocent one as far as this gentleman was concerned, for he was only a casual acquaintance and had no way of knowing how touchy the writer is on the implications that all too often accompany the use of this expression. When intelligently applied, of course, "accepted practice" is one of the cornerstones of our existence and no one could be more categorically opposed to changing, just for the sake of changing, than the writer. Failure to change, when a change is indicated, however, is equally unforgivable; and in all the engineering fields of application I can think of no more dangerous spot to rely blindly on "accepted practice" than in municipal storm drainage design.

To express it in another way, there is probably no other engineering design procedure that is farther removed from an exact science and more dependent upon common sense than the design of storm sewers. Primarily this is due to the infinite combinations of variable factors involved which virtually defy the use of conventional formulas or rules. In other utility fields one can normally calculate within reasonable limits the quantities to be designed for. In drainage work, however, with the varying types of soil, variable slopes, varying types of man-made surfaces, and most of all with rainfall intensities, durations and antecedent patterns quite unpredictable, the problem of arriving at a reasonable "Q" is extremely complicated—not from the mathematical standpoint, but simply in the matter of determining which of the many factors involved are going to have significance, and to what extent.

If we are inclined to think of it as a gamble today, however, consider what it must have been like in the days just prior to the turn of the century before the advent of the "Rational Method of Design." In that era the so-called "Formula Methods" were in use. It was left for the Rational Method to recognize for the first time the existence of a definite relationship between the physical characteristics of any piece of ground and the type of storm that would result in the greatest peak runoff for that area. More specifically, this principle states that the rain which will produce the greatest peak runoff for any particular area will be the rain of the highest intensity that can be expected in any particular geographical area with a duration equal to the time of concentration for that area, or the time required for the most remote drop of rain water in the area to find its way overland to the point where it enters the sewer. Thus the character of the critical rain would be a function of the time of concentration, which in turn would be a function of the size, shape, slope, and other physical characteristics of the area to be drained.

In addition to the recognition of this principle, however, it is necessary to know for each particular geographical area the maximum intensities that can be anticipated for various relatively short duration storms, and as of today we have some 75 years of U. S. Weather Bureau records which provide this information and make it possible for the engineer to prepare his local "Intensity-Duration" curves.

Because of what hinges on these records, the writer has been constantly intrigued for close to 40 years by the unimportant but very interesting question of why such records ever were started. Did the Weather Bureau first collect the data and an engineer later figure how it could be used, or was it the other way around?

First Collection of Data

The matter remained an enigma until about two years ago, at which time the writer was corresponding with Mr. J. van de Erve, Western Area Engineer for the U. S. Weather Bureau at Sacramento. In a moment of curiosity I asked Mr. van de Erve whether he was acquainted with the origin of the short-duration high-intensity weather records. He replied in the negative but referred the matter to the Washington Office of the Bureau where Max Kohler, Chief Research Hydrologist, unearthed the information in some of the old issues of the "Monthly Weather Review." Referring particularly to Volume 17, page 62, of the "Monthly Weather Review" of March, 1889, Mr. Kohler commented as follows: "From this reference we may gather that there was at that time an awarness of the need for intensity observations in application to certain engineering problems, and that this was the primary consideration in the genesis of the short-duration excessive-precipitation records."

To the writer at least, this was almost like finding the proverbial lost gold mine and it takes very little imagination to fill in the rest of the story. Sometime, probably in the 80s, a creative thinker recognized the principle which all the old "formulas" ignored and which was later incorporated into the "Rational Method of Design." The new method could not function, how-

● **FIRST STEP** in measuring storm flow, after the selection of a typical block (see text), was to check the rate of flow from the fire nozzle into street gutters.

● **WATER** is flowing down the street gutter from fire nozzles to the inlet where the recorder is installed. In this way, recorders were calibrated for storm flows.

ever, without at least some data on the character of the short-duration high-intensity storms that could be anticipated in various parts of the country. The Weather Bureau was doubtlessly approached on the subject, took steps to procure the records, and in probably ten years had enough data to set the wheels in motion. Thus the Rational Method came into being sometime about the turn of the century and provided us with a logical basis for municipal storm drainage work—something that is the very antithesis of the rules and formulae and accepted practice philosophy previously referred to.

Through the years many adaptations and modifications of the original procedure have been made, some of them extremely complicated in nature, others relatively simple. It was one of the latter that provided the basis for this discussion and was carried out by the writer in Puyallup, Washington, a small city of some 12,000 population just five miles from Tacoma. Soon after coming to the city a few years ago the need for two large storm trunks to serve the entire city became apparent. Consequently rainfall and runoff phenomena in the area became a subject for observation and speculation. As a result of such observations several interesting facts were noted.

● **RECORDER** was installed in a concrete basin back of the curb, with opening to permit recording of actual flows.

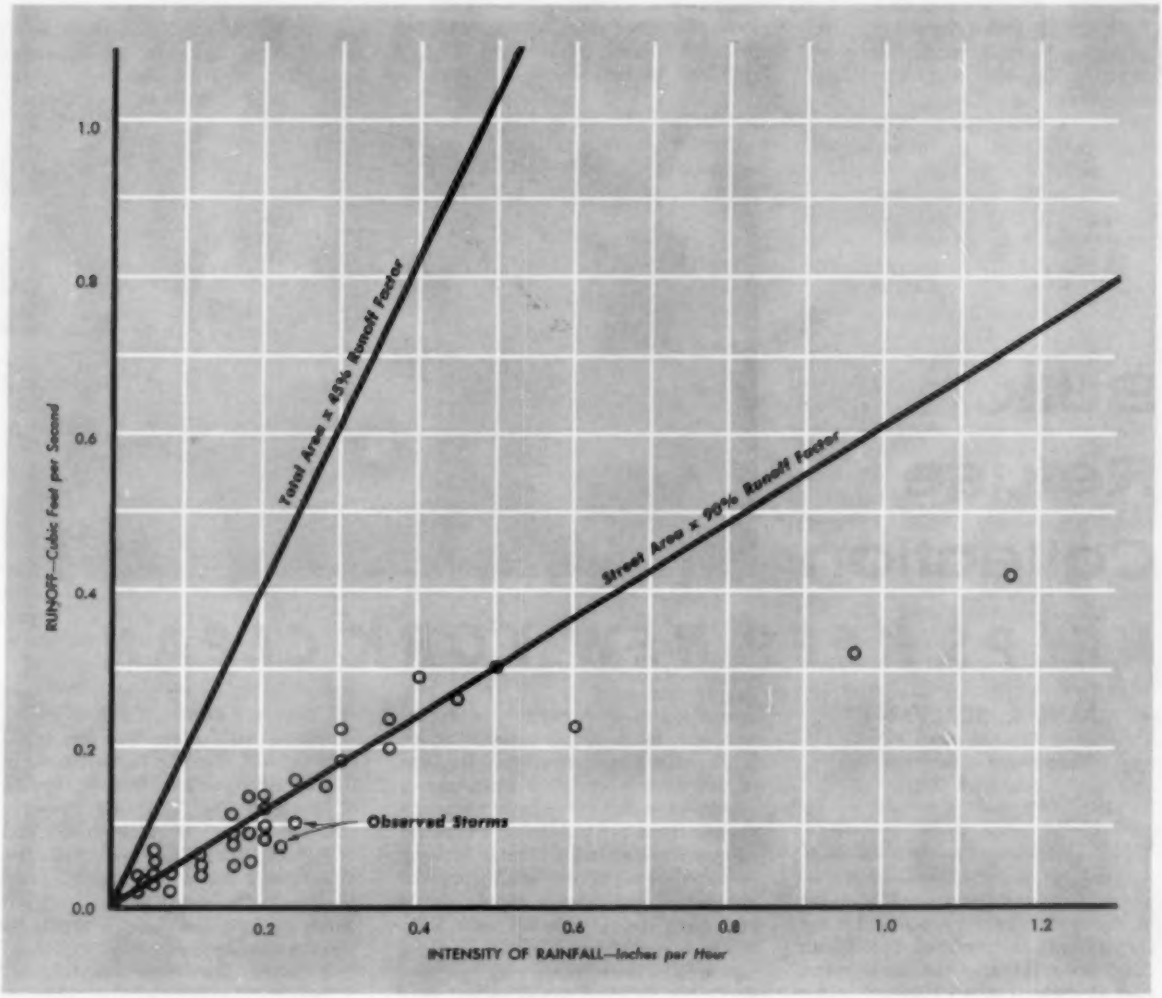
Choosing a Runoff Factor

To begin with, in Tacoma, all storm sewer designs for residential areas in recent years were based on a formula using the total area under consideration times a runoff factor of 45 percent, which is the equivalent of saying that 45 percent of all the water falling on the area would find its way to the sewer in a reasonably short time.

Despite the short distance between the two cities, the topographical features of Tacoma and Puyallup differ radically. Tacoma is hilly, the soil is of glacial origin and much of it is quite impervious. Puyallup, on the other hand, is flat with a soil that is extremely pervious.

Our preliminary observations in Puyallup during the first winter made it clear that whatever percentage of the total rainfall might reach the sewer, none of the rain which fell inside the street property lines ever reached it. The normal ground was too flat and too porous. So certain did this seem that we reached back a few years for a concept that we had developed during the war and later used in cases where there was a predominance of paved areas, namely, ignoring the unpaved areas completely and basing the design solely on the paved or impervious areas times a runoff factor of 90 percent. We hastily ran through the design of the proposed lines on this basis and as a result of the street pattern in Puyallup, it turned out that if we could provide the necessary justification for using such a procedure, the cost of the proposed storm trunks would very likely be reduced by as much as 20 percent; and this, on a million dollar job, is important, especially in a small city. The whole thing hinged on just one point—were we or were we not justified in using the street area only and a runoff factor of 90 percent. To settle the point it was evident that we were in need of a research project.

In setting up our study we first had to locate a typical city block—one that was completely built up with homes; one that was typical as far as topography and soil were concerned; one in which the streets were completely paved; and one in which the street grades were such that all of the rain falling within the block would be concentrated at one point, and no water at all could enter the block from the outside.



● **RAINFALL-RUNOFF observations on a typical block indicated the preferred formula to use for storm drainage design.**

Such a block was located eventually and the next step was to secure the necessary recording equipment. The U. S. Weather Bureau was contacted and through the coperation of Mr. van de Erve, a recording rain gauge was provided and assistance given us for setting the instrument up in a back yard in the middle of the block and in operating and maintaining it for the next two years. At the low corner of the block where the water from all gutters was concentrated, two Stevens Type F recorders, loaned to us by the City of Tacoma, were installed in concrete basins back of the curb with water entrances in the face of the curb so that at all times the instruments recorded the actual water level in the gutter.

How Flow Was Measured

Since the recorded depth had to be expressed in terms of rate of flow, our own Fire Department was next pressed into service and with the recorders operating, a fire hose was discharged into the upstream gutter at several accurately measured rates of flow in gallons per minute. The point where the needle rested on the charts during these flows was carefully noted and from this information a graduated scale was prepared on transparent material so that thereafter the data recorded on the charts could be quickly translated into gallons per minute. During the next two years, a complete record was made of the amount of rainfall and the amount of runoff in this particular block.

For cataloguing and analyzing the information collected we finally settled on a simple form. One of these was filled out for each storm of any consequence. The three most significant entires appear at the bottom under "Comparative Data." The first of these is the "Q" or design rate of flow that would have resulted if the whole area x 45 percent, x the observed intensity had been used. The second is the "Q" that would have resulted if street area only x 90 percent x the observed intensity had been used. The third is the actual observed "Q" for that particular storm. Thus the whole procedure merely resolved itself into finding out which of the two design possibilities more nearly approached the true facts.

One other preliminary determination was necessary to validate, as it were, the observations we hoped to make. This was the matter of establishing, to the extent possible, the type of storm (intensity and duration) that would be the most severe for this particular area. As previously explained this would be a storm of the greatest intensity that could be anticipated for a duration equal to the time of concentration for the area. This required to begin

(*Continued on page* 128)

Bulk Refuse Collection

HELPS KEEP NEW YORK CLEAN

PAUL R. SCREVANE
Commissioner,
Department of Sanitation,
New York City

THE Department of Sanitation of the City of New York began its Clean City program in 1955. One of the activities undertaken by my Department as part of the Clean City program was to institute a special collection service for bulky discarded objects such as bed springs, refrigerators, stoves, etc., which cannot fit into our fully enclosed refuse collection vehicles. This class of refuse ordinarily poses a difficult problem for the average householder who may be at a loss as to whom to turn for assistance in the disposal of such material. It had been our experience that this class of refuse found its way into vacant lots, areaways and other vacant spaces where they were dumped and forgotten. It was evident, as our Clean City program got underway, that a special service was needed to dispose of this refuse in order to prevent unsightly and littered lots. Accordingly, in 1955, a special service was established with the intention of limiting it to one week in the Spring, which was designated as Junk Collection Week. (Previously, in 1954, only one day had been set aside for the collection of this junk and our crews had picked up nearly 400 tons in the one day.) The one week's output was beyond our expectations and resulted in a huge outpouring of 5,400 tons which required the use of 160 trucks and 400 men. As a result of this very favorable response from the public, and because of many requests for similar service, it was decided to establish a special collection service on a regular basis and have it available all year.

We started the program with a makeshift fleet made by cutting down obsolete enclosed refuse collection trucks which were on hand at that time. The old refuse trucks were converted into open dump trucks by removing the roof and the upper portion of the sides of the truck. As these trucks began to be used, we realized the need for eventually purchasing new equipment specifically designed for bulk collection and other uses. When funds became available, 20 new vehicles were purchased by open competitive bidding. Each of these trucks in use now has an International Harvester chassis, and a Daybrook body and tailgate.

The specifications for 25 additional units to be delivered in 1961 provide for a heavy duty truck with not less than a 32,000-pound gross vehicle weight chassis and a dump body with hoist and hydraulic tailgate. The chassis is designed so that a snow plow can be mounted in front and the vehicle used for plowing in snow emergencies. Single tires are on the front wheels while dual tires are on the rear wheels. All tires are 1200 x 20, 14-ply with puncture seal tubes. The electrical system includes an alternator, in lieu of a generator, which is capable of keeping the batteries properly charged under our slow-speed and many-stop operating conditions. The dump body has a nominal 12-cubic yard capacity with a minimum front width of 81 inches which tapers at least 3 inches from front to rear. The sides are approximately 46 inches high to obtain the required volume. The body is made of No. 12 gauge Corten steel or equal, except the floor which is of No. 8 gauge.

The hydraulic powered tailgate, operating from a separate PTO connection, has at least 2000 lbs. direct lift capacity with controls on each side of the rear of the body. The tailgate provides a loading platform approximately 91 inches by 41 inches. A rubber seal is provided at the rear of the body to seal the tailgate to prevent spillage when carrying rock salt or other loose materials. The tailgate can function as a:

1. Direct lift power gate for handling and loading heavy bulky objects.
2. Standard dump body tailgate in the locked body position since it is provided with a top hung inner section approximately 35 inches high for dumping salt or other materials into restricted areas by raising the dump body only.
3. Locked tailgate, extended from the body floor line for dump body

floor extension, for use in dumping material in piles on the ground while the vehicle moves forward away from the piles.

Organization

For operational and administrative purposes, we divide the City of New York into eight borough commands which are further subdivided into 57 Sanitation Districts. (The average Sanitation District has a resident population of approximately 140,000.) Service units were established in each of the eight borough commands and these arrange for the pick-up of the bulky refuse on fixed schedules. From its inception in 1955, until the end of that year this program resulted in 16,854 loads which totaled 34,213 tons of old furniture, refrigerators, etc. Table 1 summarizes the statistics on this service since its inception. The steady increase in the quantities collected attest to its effectiveness and popularity.

It may be of interest to describe in some detail the procedures that are followed in handling bulky refuse. The first step is to publicize the availability of this free service so that the public is aware of the fact that only one telephone call is required to request the special collection service. The publicity measures include the printing on cards of the telephone numbers to be called for information on free junk collection. These cards, which are widely distributed to apartment house superintendents, tenants and to all others who may be concerned with this problem, are printed in English and also in foreign languages for our foreign-born residents. In cooperation with the Citizens' Committee to Keep New York Clean, a booklet was prepared which summarizes New York City's Health Code and the phone numbers were also included in this booklet. Approximately 3,000,000 pieces of literature giving the bulk collection procedures and phone numbers have been distributed in the City since June, 1955.

In addition to the aforementioned printed items, our Public Relations Office gives out this information when written or telephone requests are received for it. In addition, periodic news releases are issued advising the public of this service and we have been able to have these extensively quoted through the radio and other media.

The mechanics of organizing and servicing such calls for 8,000,000 people is outlined below since it may be of interest to municipal officials who are faced with similar problems, but on a smaller scale.

Table 1—Quantity of Bulk Refuse Collected

Year	Truck Loads	Tons
1955 (May 23 to Dec. 31)	16,854	34,213
1956	22,633	47,944
1957	25,938	54,602
1958	29,570	61,379
1959	35,316	74,250
1960 (Jan. 1 to Aug. 31)	29,376	56,098

By definition, a bulk item is defined as a large article such as a chair, table, piece of upholstered furniture, refrigerator, stove, etc., which cannot pass through the side door (34½ in. square) of our fully enclosed collection trucks. Smaller objects such as lamps, screens, rugs, etc., which in the aggregate would occupy space equivalent to a large item, would be classified as one item.

The person requesting the service telephones the unit at one of our Borough offices. The employee taking the request advises the caller that he will be contacted by our local sanitation office and a specific date will then be set for the pick-up.

There must be some reasonable limitation on the number of items to be collected at one time or it would become impossible to make definite commitments for pick-up dates. Therefore, for apartment house occupants, a maximum of six bulky items for pick-up is allowed. If more than six items are to be collected, then two or more dates are arranged to remove all the material. It has been our experience that only a very small percentage of callers require more than six bulky items to be removed at any one time. For the rare case, where the householder has a large quantity of material, but is unwilling to wait for several pick-ups for its complete removal, or desires that the refuse be carried out, he is advised to consult the classified edition of the telephone directory where he may find a listing of private cartmen who can be engaged for this service. In one and two-family dwellings, since storage space is usually smaller than in apartment house basements, discarded home furnishings are removed in one service regardless of the amount. Thus, when a one-family house occupant purchases a new living room or bedroom set, we attempt to cooperate by removing the old furniture in one pick-up, if available truck space permits. Our experience has been that, here again, it is only the rare case that requires more than one service to remove all the material. Regardless of the type of building, the discarded material must be brought to the curb by the householder or the building superintendent. Our collections are made from curbside only. All of the bulk debris is delivered to land fills for disposal.

For internal control of this activity, the Department uses mimeo-

● **TAILGATE** of one of the twenty new open trucks for bulk refuse collection is shown here in open position.

● **THIS** view shows the tailgate in dumping position. These new trucks also haul street dirt, rock salt, snow.

● **REAR** view of dump truck with power tailgate. In addition, 148 open type trucks were modified for this work.

● **HEAVY and bulky refuse is handled easily with the power tailgate truck. Here Commissioner Screvane, at the right, is operating the controls for the power tailgate. Handling of very heavy items is accelerated and burden on men is much reduced.**

graphed routing and record forms. The clerk in the service unit at the borough office who answers a request for such service, determines initially the eligibility of the premises for the Department's service. In general, residential premises only are eligible. Each eligible caller is requested to give his name, address, telephone number and type of premises which information is recorded. Each caller is advised that it is a free service. He is also told that the local Sanitation District will telephone him within 24 hours, or the next regular work day, in the event that a Sunday or a holiday intervenes, to determine the amount and type of material and to arrange for a mutually convenient date on which the refuse can be picked up. The clerk then records the time and date. The form with the foregoing information is then forwarded to the District in sufficient time to insure that the caller will be contacted within 24 hours by the local district. To accommodate householders who may be at business during the daytime, follow-up district calls may be placed by night shift personnel, but all follow-up calls to householders are required to be made before 9:00 PM.

At the local District headquarters, a clerk takes the original form and completes it by filling in the data obtained from his working with the request. This develops a complete record, including the date and time when the householder is contacted for the mutually convenient pick-up date and also describes the refuse to be collected. Collection schedules are then arranged at the district level so that requests are serviced, whenever possible, within one week of the householder's initial telephone call.

To control the collection operation at the District level, the District Superintendent completes an additional form which gives the details for each day's scheduled bulk collection service. The men on the truck then have a definite route to follow and know exactly where to go and how much material they are to remove. The type and amount of material scheduled to be removed are recorded in addition to the actual amount and type and any necessary explanatory remarks. At the end of each shift, the completed form is returned to the District Superintendent for inspection and any appropriate action as required by the notations.

These procedures have developed from our more than five years experience with this service. It has resulted in a sharp decrease in the amount of bulky discard which had previously gone into our vacant lots and areaways. Another benefit has been a reduction in fire hazards in residential buildings since there is now a simple, convenient way for householders to get rid of such unwanted materials. We have been advised by the Fire Department that the Clean City Program, particularly the bulk collection service, has been one of the factors resulting in reduced fire hazards in tenement neighborhoods.

Equipment in Use

To handle the calls for this service, (currently averaging 11,000 calls weekly) the Department operates a fleet of 148 open dump trucks made by cutting down obsolete enclosed refuse collection trucks. Supplementing this fleet are the twenty new open trucks with power tailgates which can be used for bulk collection, plus other duties.

Incidentally, this fleet of open trucks was invaluable when Hurricane Donna struck the city in September. As in other cities in the path of Donna, we had our share of fallen trees, earth washouts, and other storm-created street debris. From September 13 through October 6, 1960 there were 6,606 loads of debris removed by our fleet of bulk trucks which represented 84 percent of the storm debris removed by all types of sanitation vehicles.

LIME USED TO IMPROVE HOT MIX

A. LEO GALLAGHER

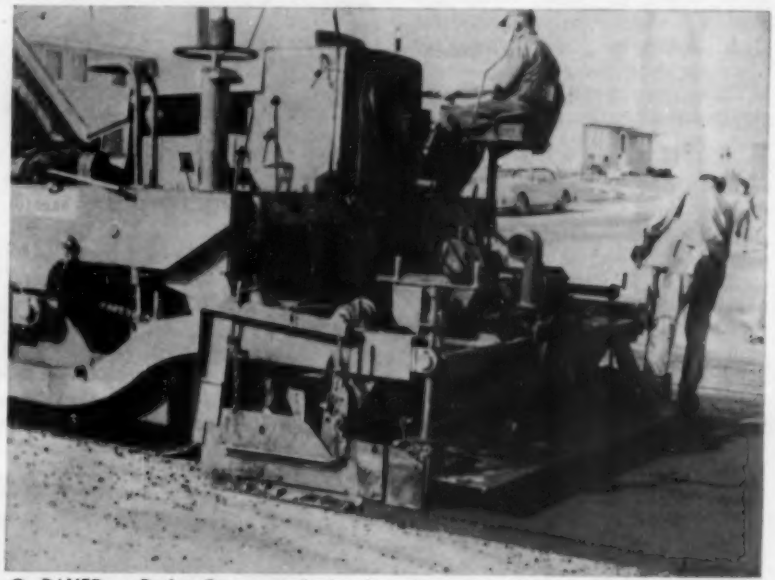
HYDRATED LIME, already well established as a road base stabilizer, is now being used successfully as a chemical additive for asphalt hot mixes in Montana. Among the latest projects were three Special Improvement Districts in the capital city of Helena, involving a total of nearly 200,000 sq. yd. of street and parking lot paving, which were built last August and September. The mix on each project consisted of a well-graded crushed aggregate (with zero P.I.), 6.25 percent asphalt, and 1 percent hydrated lime. The principal functions played by the lime were to prevent stripping, to reduce swell, and to improve the strength characteristics of the asphaltic mat.

Job control for the projects was based primarily on three tests: Montana Highway Commission Strip Test Method; Volume Swell and Water Absorption Test for Bituminous Mixtures, A.S.T.M. D 915-47T as modified by the Montana State Highway Department; and the Marshall Stability Test. Without lime, the average swell of the asphaltic mix was 15 plus; with 1 percent lime, the swell was reduced to 5. The lime-treated mix similarly showed marked improvement in the visual anti-stripping test. Marshall test values were also increased from 1800 lb. to 2600 lb. with the addition of lime. It is interesting to note that field testing during construction confirmed the improved characteristics obtained in the laboratory. This improved strength and toughness was also apparent to contractors who had to break into the new pavement to make water connections, etc. The city plans to take cores in the future to determine the long range changes in strength and durability.

On two of the projects, the typical section incorporated a compacted subgrade, 5 in. of select subbase (3-in. max. size), 2-in cushion, and 2-in. hot mix asphaltic concrete, using asphalt with 100/120 penetration. The third project incorporated a compacted subgrade, 2-in. sand choker, 5-in. base course, 2-in. cushion, and 2-in. hot mix (120/150 penetration). The seal coat consisted of RS-K cationic emulsion and 3/8-in. chips.

The engineering and supervising work on the three improvement districts was handled by Morrison-Maierele Inc., Helena, Mont.; S Birch, Inc., Great Falls, Mont., was the contractor. Bagged lime used in the hot mix was supplied by Elliston Lime Co., Helena. It was fed into the hot mix plant at a constant rate by means of a screw-feeder screw-conveyor combination.

Many people connected with paving and highway engineering are not very familiar with the improvement possible and the economy of using lime in this type of pavement. The addition of lime is fairly inexpensive, since a 1 percent application means only 20 lb. per ton of hot mix, or approximately 1 lb. per sq. yd per in. of compacted depth. It is hoped that this article may shed a little light on this application in other areas where stripping and flexible pavement failures have been a problem.



● PAVER, a Barber-Greene, is laying hot plant mix. Paver is followed by 10-ton steel wheel roller; and compaction is completed by a 25-ton pneumatic tired roller.

● HYDRATED lime is being added to the dried aggregates at 325° at the rate of one percent or 20 pounds per ton of hot mix or one pound per sq. yd. per inch.

WATER AND SEWERS FOR Freedomland

MANY an engineer and contractor may have theorized how he would go about putting in a water supply and sewerage system for the U. S. A. Such an opportunity recently came to Cabot, Cabot and Forbes Associates, as engineers, and C. H. Cronin Inc., as contractor, on a scale model basis.

These firms were responsible for the water supply, sewage collection, and associated plumbing for Freedomland, U. S. A., recently completed in the East Bronx section of New York City. Both firms were part of a team working with Turner Construction and Aberthaw Construction as joint general contractors for the $65 million project.

Shaped in the form of an outline map of the United States, Freedomland incorporates 205 acres, 85 of which contain a total of 39 attractions based on "fun themes" derived from our national history. The remaining acres are used for parking and stabling livestock and other housekeeping activities. It is designed to accommodate 90,000 people daily. It contains 8 miles of navigable rivers, lakes, and streams, and every installation is designed and constructed to last at least 50 years.

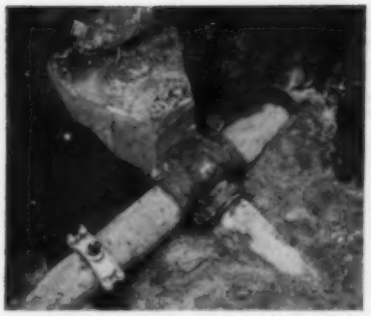
Any municipality would be proud of Freedomland's half a million yards of paving and its parking facilities for 12,000 cars, 15,000 transplanted trees, walkways, shade areas, rain shelters and rest rooms, all facilities designed to accommodate a maximum simultaneous attendance of 32,000 people. Restaurants and other eating places can serve 30,000 per hour. It has a permanent payroll of 3,000.

Freedomland was designed and built by Marco Engineering Company. Its U. S. A. shape was conceived to make it possible to have historical installations set in their approximate geographical locations. Fourteen theme-chapters of our nation's past are brought to life: for example, a Civil War battle, satellite base, Mardi Gras, fur trapping and the Northwest Passage, among others.

The completed center resulted from a huge, fast-moving job of construction, built in approximately

● **FREEDOMLAND'S layout resembles roughly the map of the United States. The 39 theme installations are in approximate geographical locations in 16 specific areas.**

● **LAYING a water main, a 10-inch line that is part of a main loop supplying the 205-acre area. This is an old sanitary fill and soil composition is interesting.**



● **TYPICAL installation shows thrust block, hydrant connection and stop cock.**

300 days by a force that reached a peak of 2200 men in the field at one time.

Freedomland is situated in a triangular area bounded by the Hutchinson River, Hutchinson River Parkway, and the New York Thruway. It grew out of an undeveloped area that was originally marsh land requiring more than a million yards of earth moving plus an additional 250,000 yards of fill carted in from 25 outside sources to raise ground level in some areas.

The water system was designed for a peak capacity of 5,000 gpm. New York City mains were utilized. To these were connected approximately five miles of Transite water pipe, ranging from 4 to 12-in., and over a mile of Transite sewer mains, ranging from 6 to 12-in. In addition, considerable quantities of Transite 6-in. building sewer pipe were used to connect rest rooms, restaurants, and similar facilities to the sewer mains.

Water is supplied to Freedomland through two 12-in. mains originating at city lines, one at Bartow Avenue and the other at 222nd Street, both off the New York State Thruway. While either main is sufficient to fill the needs of the center, the alternate main was installed for emergencies. City pressure is sufficient to assure adequate water for all needs, especially automatic fire sprinkling systems, and for the approximately 26 hydrants available to the twelve-man fire department maintained by Freedomland's management.

Both the sewer and water mains form more or less parallel continuous loops around the periphery of the 85-acre area. To overcome extremely poor soil conditions, particular attention was given to use of properly-designed thrust blocking at every fitting and valve. The unusually low vertical bearing strength of the soil made it desirable for all foundations to be pile driven to 30 to 40 ft. for bearing strata. Horizontal bearing loads of the soil were almost impossible to compute since the fill varied in composition and density from one foot to the next. Cast-in-place concrete thrust blocks were utilized for all pressure pipe, following published recommendations supplied by the pipe manufacturer, Johns-Manville. In addition, subsequent subsidence of the soil can be accommodated by the Ring-Tite Transite joint which allows up to 5 degrees of deflection at each joint.

Piping to hydrants was in each case a minimum of 6-in. to assure maximum pressure and flow. Taps for building supply and water fountains ran up to 2-in. copper, for which saddles and corporation stops were utilized.

The trenching for the sewer lines followed the contour of the trenching utilized for water supply. Class 1500 was used in 10 and 12-in. diameters, including 2162 ft. of 10-in., and 2400 and 3300 classes of pipe were installed for the remaining 6- and 10-in. lines.

Again soil conditions presented important problems. The soil was extremely corrosive, being acid in nature, and ground water levels were sufficiently high to pose the possibility of excessive infiltration.

Using 6-inch building sewer joining 10-inch pipe at the outlying areas, the sewer mains build up in size from 10 to 12-in. diameters. All flow is by gravity into a pumping station wet well near Adee Avenue and the Thruway. Manholes are all precast concrete, 5-ft. in diameter with a 5-in. thick wall. Covers are also precast. Maximum pipe depth is 7 to 8 feet.

The prefabricated pumping station operates on a three-level arrangement with three separate pumps. Phases of operation are 300, 600, and 1200 gpm achieved by two 300 gpm pumps and one 600 gpm pump going into consecutive operation as the level in the 10-ft. high, 6-ft. diameter wet well rises. The lift station feeds an 8-in. force main that goes into the city limits.

Facing a tight deadline, C. H. Cronin's crews battled time and weather throughout the job. The first sewer pipe went in on December 3rd; both water supply and sewer systems were operating efficiently by June 19th, when Freedomland officially opened on Fathers' Day, 1960.

The top daily attendance in 1960 occurred on opening day with 61,500. Average daily attendance during the season was 17,500. Average water consumption was about 600 gpm. It reached a peak of 2,000 gpm when it was necessary to pump water into the Great Lakes to keep them at the required level.

● **OPENING DAY crowd at Freedomland last summer. Design will care for 32,000 visitors; restaurant facilities will handle 30,000; there are 12,000 parking spaces.**

Texas Prepares to Evaluate Radioactive Water Pollution

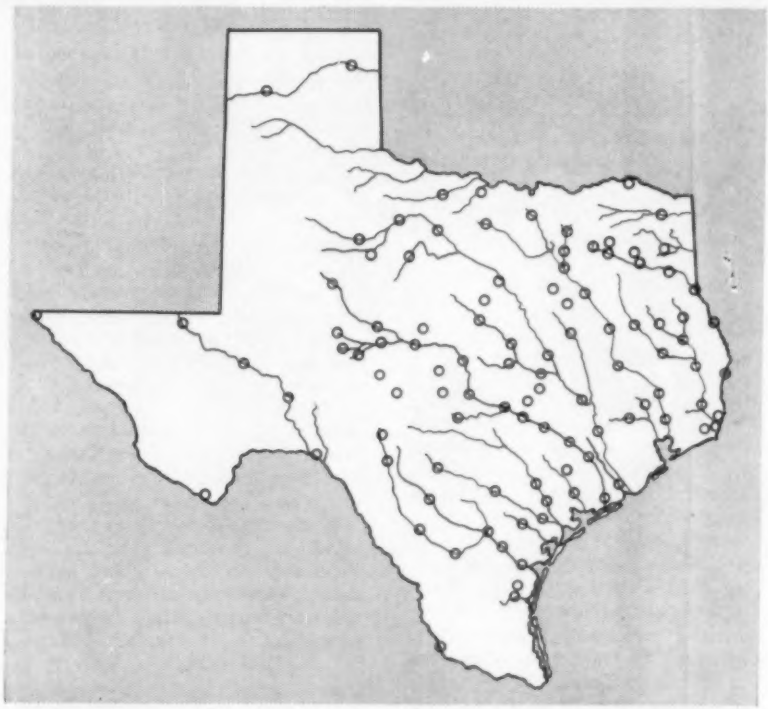
HERBERT A. BEVIS

Chief, Ionizing Radiation Program, Division of Occupational Health, Texas State Department of Health, Austin, Texas

IN MANY respects, radioactive wastes are no different from other organic or chemical wastes. The same principles for the control of pollution will apply, and it is neither necessary nor even desirable to set up a special organization to deal with pollution from these materials. This is not to say that new or different problems will not be encountered. To assess potential problems it is necessary to acquire a fundamental knowledge of basic radiation, but this does not mean that all must become health physicists. In addition, laboratory facilities to detect and measure radiation will have to be developed. This is not an insurmountable difficulty, however. A quite similar expansion was required when programs oriented toward organic pollution were faced with the problem of coping with new complex industrial waste pollutants.

Let us compare the possible impact of various wastes on a stream. For most organic materials a stream will have a definite capacity to receive wastes. The dissolved oxygen will probably drop, but if the waste is not excessive it will return, describing the classic oxygen sag curve. Chemical wastes are somewhat different in that often the stream lacks the ability to treat the waste and relies on simple dilution. A similar situation exists for radioactive wastes.

The physical process of sedimentation may reduce the level of particulate radioactive materials suspended in a waste discharge. The actual degree of reduction will depend upon the density of the particles and the turbulence of the stream. A reduction in dissolved radioactivity may accrue from ion exchange mechanisms involving bottom sediments. Many silts have fairly good ion exchange properties. Additional removal of dissolved activity may be realized through biological activity within the stream involving both plants and animals.



● **LOCATION of surface-water sampling stations for background radiation study.**

For example, plankton and algae can selectively absorb large amounts of certain radioisotopes directly from the water. Phosphorus-32 is sometimes concentrated by a factor of ten thousand or more by these organisms. It is interesting to note that botton animals which feed on plankton and algae also contain sizeable amounts of activity but less than their food on a unit weight basis; juvenile fish, which feed on the bottom animals, less activity and; the adult fish, which feed on the juvenile fish, the least activity. See reference (2).

What might initially appear to be a treatment process destroying the radioactivity is in reality storage of the material in the stream. All these removals are temporary. During periods of high flow the bottom sediments will be resuspended, and when the plants and animals die the activity they contain will be returned to the stream.

The Background Survey

In order to evaluate the impact of a given discharge of radioactive waste upon a waterway, it is necessary to have knowledge of the background radioactivity commonly present in the stream. This fact was recognized by the Texas State Department of Health several years ago and the Division of Water Pollution Control initiated a program to establish these baselines. Since the State Department of Health Laboratory was not prepared to undertake the analysis of large numbers of samples for radioactivity the study was contracted to the Sanitary Engineering Research Laboratory of The University of Texas under the supervision of Dr. Earnest Gloyna.

Some 117 of the 264 sampling stations utilized by the Division of Water Pollution Control in its water quality survey program were selected for radiological investigation. These sampling points involve 58 streams and include all of the major waterways of the State. Due to the time required for the preparation and analysis of water samples for radioactivity these samples were collected on a monthly basis rather

than the two-week interval utilized for other types of pollutants. The samples are analyzed for the gross alpha and gross beta activity occurring as suspended solids and as dissolved solids. Where significant increases in radioactivity were detected, further investigation was attempted to determine the specific isotopes involved. These data are currently being processed to provide statistically valid reference levels for future comparison.

While it is too early to give detailed results of this work, some preliminary observations have been made. Certain streams originating in, or flowing through, geological formations high in natural radioactivity, notably the Canadian, Upper Rio Grande, and Upper Brazos rivers, show higher levels of activity. Although the dissolved activity is generally higher, the increased activity in these streams was detected primarily in the suspended solids fraction.

Frequently it was noted that during periods of high flows, the concentration of radioactive materials increased. This apparent anomaly can probably be attributed to fallout from weapon testing. It was concluded that during a rain, material which has settled upon the earth is washed into the streams; the increase in activity is greater than the dilution factor of the rain, and this the net effect is one of higher concentrations of radioactivity. During prolonged periods of rain, which exceeded the time for flushing away the accumulation of fallout material, a decrease in the concentration was noted, further justifying this hypothesis.

These background studies indicate that none of our streams has been polluted by the atomic industry and, indeed, the only radioactivity detected can be attributed to natural radioactivity and fallout.

Future Sources

What does the future hold? Power reactors may be slow in coming to the Southwest because of the abundance of fossil fuels, but they will undoubtedly make their appearance in due course. In the meantime research reactors are already here. There are currently four nuclear reactors in operation in Texas, one in the construction phase and one in the process of design.

Attendant to the production of energy in a reactor, there is the formation of radioactive fission products. The rate of production of these fission products is a direct function of the power level of the reactor. For reactors the size of the one located at Shippingport, Pa., fission products will amount to about 100 curies per day before treatment. (3)

Neutrons released during this fission reaction cause the "activation" of some materials with which they come in contact. As a consequence a certain amount of radioactivity will be induced in structural elements of the reactor. These reactor components are subject to corrosion which may result in the release of some of this induced activity.

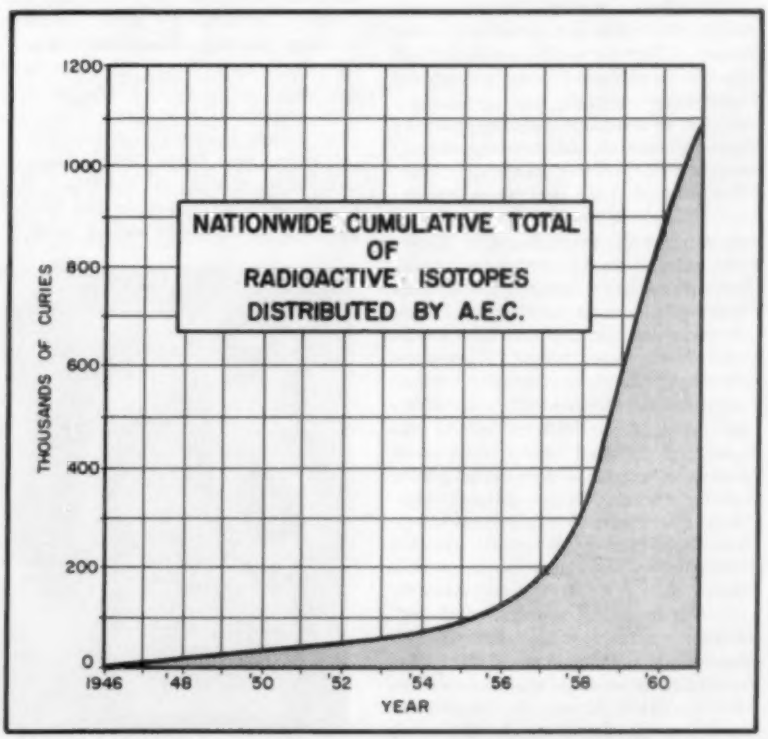
The primary heat exchange medium, which is also subject to this activation, can be the source of considerable activity if leakage occurs. Likewise, water used to cool the reactor may be subject to neutron activation. For this reason special caution is exercised to control the mineral content of the cooling water to keep the induced activity to a minimum. Small quantities of radioactive wastes may also result from laboratories, laundries and decontamination operations at the plant.

It should be pointed out that the level of radioactivity resulting from these latter sources is of an entirely different order of magnitude than that associated with the fission products. These are low level wastes, which will probably be in the microcurie-per-milliliter range, and might be released to a waterway after temporary storage or treatment.

For efficient reactor operation it is necessary to replace fuel elements after only a small percentage of the nuclear fuel has been used. The spent fuel elements containing the fission products are transferred to special chemical processing plants to reclaim the valuable uranium and plutonium. The separated fission products are concentrated to reduce their volume and placed in permanent storage. This is an expensive procedure, costing from $0.25 to $1.50 per gallon, but no other acceptable method has yet been developed for handling these high level wastes. There are currently approximately 65 million gallons of this type waste material in storage at Atomic Energy Commission installations. (4) These wastes may require storage for hundreds of years before they will have decayed to a level to be safely released to the environment.

Although there are no uranium processing mills located in Texas at present, there is the possibility that one may be constructed to process ore from the Karnes County ur-

(*Continued on page* 102)



● **SHARP increase in use of radioactive isotopes during recent years is indicative of the need for establishment of a baseline of natural radiation in streams.**

SUCCESSFUL REPAIR OF STREET OPENINGS

E. F. HENSCH
Director of Public Service and City Engineer, Duluth, Minnesota

ENGINEERS and contractors have combined efforts through the years in developing materials, methods and equipment which have removed 99 percent of the necessity for "trial and error" in the construction of streets and highways. A set of plans and specifications will, if followed closely, produce a highway adequate for the design load. The surface, when laid according to specifications, will provide a riding quality of the degree required. Although top quality materials and workmanship are expensive, most public works officials agree that they are a good investment when considered from the standpoint of maintenance and public acceptance —provided, however, that steps are taken to protect the initial improvements. Many well-constructed streets with good riding surfaces have been virtually ruined because of one or both of two reasons: 1) Lack of routine maintenance and 2) improperly restored trench cuts. The first of these two items has, in these days of municipal state aid, shown much improvement. Cities and villages are in most cases establishing adequate maintenance programs. It is now seldom necessary to delay sealing a bituminous roadway or to delay crackfilling a concrete pavement beyond the critical point because of a meager maintenance budget. The old problem of improperly restored trench cuts does, however, continue to plague public works officials. This problem is analogous to that which involves driveways plugged from snow plowing operations. They are both causing much concern to Minnesota city officials from the standpoint of cost, inconvenience and discomfort to the motoring public. The writer has compiled a certain amount of material, based upon his experience and that of others, which may serve as an approach to the problem of trench cuts.

The proper restoration of the subgrade, base and surfacing of a high-type paved street, after a trench cut, does not at first glance appear to be a difficult task. Public works officials have found, however, that stringent regulations on compaction methods and equipment, monetary deposits, etc. are only half of the solution. A trench dug in the winter months cannot, in most instances, be permanently restored until the following spring after the frost leaves the ground. This is a factor which causes much difficulty in northern cities.

Let us cite an example. Assume that a private sewer service becomes totally obstructed and must be repaired in an arterial street which is surfaced with a bituminous material over a 7-in. concrete base. The line has 14 ft. of cover, is laid in an A-6 or A-7 soil, and the air temperature hovers at zero degrees during the time that the excavation is open. Much of the excavated material, saturated with sewage, freezes and cannot be used to backfill the trench. Since the arterial is partially out of service, the plumber and excavator are urged to restore the trench as quickly as possible on a temporary basis with whatever fill is available. A granular material is finally used in the bottom 9 ft. of the trench which is compacted by use of a Barco Rammer or some comparable equipment. The top 5 ft. of the trench is backfilled with the native soil salvaged from the frozen piles of excavated material. This also is compacted with the same device. The degree of compaction is very small, however, due to the large number of frozen chunks in the backfilled material. The contractor is advised that this top 5 ft. of material must be recompacted to the density of the adjacent subgrade soil at some later date after the frost leaves the ground. He agrees to this very willingly since it is still zero degrees and he is anxious to finish and move on to a warmer job. The surface is also patched in a temporary manner using an SC or MC bituminous mix purchased from the public works department which stockpiles the material in the fall primarily for this purpose. As it appears to the average taxpayer, the trench and surface have now been restored. He is generally not aware that the entire procedure must be repeated in the spring (at least most of it) to restore permanently the trench and surface. In fact, when it is finally restored many persons will believe that the sewer had to be repaired a second time.

This hypothetical case illustrates what cost and inconvenience to the

● **PATCHED section in AC pavement on concrete base involves area larger than normal trench cut. It has been restored with marked accuracy with surfacing.**

public is involved to this point—and the job is not as yet completed. We must continue to check the trench periodically for settlement to be sure that the patch surface remains flush with the roadway surface. When frost leaves the ground, the contractor must be reminded of his previous commitments and must be urged to resume operation on the trench as soon as possible. He will now be able to restore permanently the trench, including the concrete base, but will be required to replace the temporary bituminous patch until a hot bituminous mix is available—usually early June in northern Minnesota. The final step of obtaining a smooth, permanent, bituminous patch is in itself a major accomplishment. Many excavators, wholly unqualified to do bituminous work, will attempt to lay the patch and will obtain poor results. Even a well-qualified bituminous contractor, when working with a high-type mix, will find it difficult to lay a smooth patch under heavy traffic conditions during the cool and often wet spring or early summer months.

The contractor is not always the culprit. Many trench cuts have been poorly repaired by municipal crews, often due to improper coordination of city departments, lack of supervision, lack of adequate equipment, or a combination of these deficiencies. Trench cuts made to repair or install utility services in a street right-of-way should be closely supervised and controlled by *one* unit of a governmental subdivision. It is also desirable to have all phases of the restoration work on any one trench done by either the contractor or the city. Combining the two makes it difficult to fix responsibility in the event of a failure.

There is a considerable difference of opinion among public officials as to who should be allowed to restore a trench. Some believe that backfilling and all succeeding steps should be completed only by city crews on a cost basis, especially on arterial streets and trunk highways. Others believe that contractors should be permitted to complete the entire operation under rigid specifications and inspection. The method best for any one city will vary and will depend upon such factors as the form of government, the size of the city, organizational structure of the public works department and existing ordinances and controls. The writer is of the opinion that either method will produce favorable results if certain basic principles are followed. We shall attempt to outline these basic rules, first, on the basis of restoration of all trenches by city crews and then on the basis of restoration by contractors.

● **THIS MAY be considered a very good concrete patch. It is flush with the adjacent concrete surface and the joints in the pavement are extended through the patch.**

Restoration by City Crews

The use of city crews could possibly apply to all streets in small cities but must be limited to arterials in larger cities. Cities having utilities and public works under separate department heads must also provide for proper coordination and control. Permit procedures should be followed and should be controlled by one department only. This is necessary for the protection of existing underground installations including telephone and electric ducts, gas, water and sewer mains, service leads and steam lines. The procedure is also necessary to fix responsibility and assure coordination of all activities which would affect the drainage, subgrade, base and surfacing of a street. Most larger cities follow the permit procedure but lose its effectiveness by allowing more than one department to restore the trench and surface. Experience has proven that it is extremely difficult for one city department to provide inspection over the crews of another department.

Street excavations required for the benefit of private persons could be opened by a contractor, if so desired, on a permit basis. Such a permit might allow opening the trench only and require a fee to cover the cost incurred by the city in restoring the trench. A schedule of fees based upon the type of pavement, depth of trench and area of disturbed surface, could be established in an appendix to or part of the controlling ordinance. A deposit based on the estimated cost would require considerable cost records and would be less desirable for that reason. Some cities require the person desiring a permit to furnish a location plan, list of equipment to be used, etc. This is desirable in cities which allow the contractor to restore the trench but is hardly needed otherwise. A fairly detailed description of the location of the trench would serve the purpose.

City officials must consider a number of factors before attacking the problem by use of city crews. Personnel and equipment must be able to cope with the peak demand. Trenches in arterial streets cannot remain open beyond the time required to repair the utility. Cost accounting to justify permit fees is also a must. Since this operation is a form of contract service to private individuals, it must be self-sustaining and sufficient records should be available for proof of that point.

Whether performed by contractor

or by city crew, a clear and concise set of specifications should govern the surface cutting, excavating, backfilling, base repair and surface repair. Provisions should be made for periodic training sessions to familiarize repair crews with up-to-date methods and to indoctrinate new personnel. The foreman must generally be of high caliber since this is actually a construction operation under difficult traffic conditions and with very limited time to complete the work. The foreman's report for any one trench should include sufficient information to permit analysis in the event of a failure. This may include air temperature, general weather conditions, materials, personnel and equipment used, a brief description of work methods and any special or unusual condition which existed. The city should also own a small hot mix bituminous plant to assure a source of repair materials; however, this may not be necessary if there is a private plant within the area which produces suitable material.

Restoration by the Contractor

Most cities use the contractor method by necessity because of limited personnel and equipment. The permit, in this instance, is issued only to a contractor bonded for liability and performance, and includes a fee sufficient to cover the cost of inspecting all phases of the operation. A plan, proposed method of work and list of equipment should also be required of the contractor before issuing a permit. Some cities eliminate the filing of a proposed method of work and list of equipment but require the contractor to be pre-qualified. This is accomplished by a certification process similar to that used to certify contractors for concrete sidewalk, curbing and driveway work. The pre-qualification clause is now being used by many governmental subdivisions and should be considered when establishing controls for trench restoration. Even with prequalified contractors performing the work, any tendency to economize on inspection (in quality or quantity) can adversely affect the job.

Specifications, Methods and Permits

Regardless of who restores the trench and surface, the same specifications and methods apply: The surface should be cut with as little damage to the adjacent area as possible; the excavating must be done safely and with minimum damage to the existing sub-surface structures and adjacent street surface; the open trench must be properly guarded with flares and barricades and provisions made to re-route traffic as necessary; the backfilling must be done in such manner as to insure a uniform pavement surface during all months of the year; and, finally, the surface must be placed with care to provide the same riding quality as previously existed.

Some cities have attempted to reduce cuts in comparatively new surfaces by imposing a penalty on applications for trenches cut in new surfaces. Penalties in some cases are five times the cost of restoring trench and surface. Some type of action to accomplish this purpose, either by penalty or other means, is surely desirable.

Protection of underground phone cables, electric cables and the like is accomplished in several ways. The permit form may contain a signed statement that the applicant has checked the location of such facilities. This is followed by a phone call to the utility companies advising them of the name of the applicant and location of the trench. This particular method has been used by the writer and was very successful in reducing damage, especially to phone cables. Some cities require the applicant to furnish written clearance from utility companies but this seems rather stringent and involves considerable time.

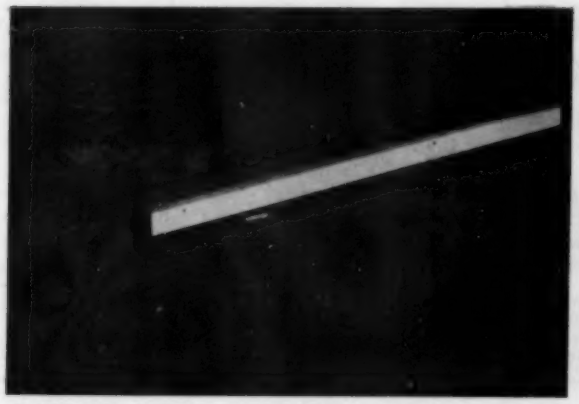
Flexible paving consisting of cutback asphalts on a granular or clay base are easily scored by use of a paving breaker and scoring tool. The cut should be made vertically and squared to include the area to be removed. Rigid paving, including concrete and bituminous paving of high density or combination of the two, are best scored by sawing or by drilling a series of holes on the cut line which should be back about 6 to 8 inches from the edge of the excavation. Sawing concrete is done in a manner which allows a proper bond between the old surface or base and the new patch. This may be accomplished by sawing only one-fourth to one-third the thickness and by breaking the remaining thickness to leave a rough face on the lower portion. The patch is thus well keyed to the old concrete while a neat smooth joint is formed at the surface.

Specifications must include some type of control on the trench width to reduce damage to the adjacent roadway section. The length of a transverse trench should also be limited to allow one-half to one-third of the roadway width to remain in service. A combination of tunneling and open trench is sometimes allowed when the facility is such that it must be repaired in one length. Tunneling should never be permitted, however, unless the applicant agrees to backfill with gunite sand. The method is similar to guniting except that cement is omitted from the mixture of sand and water.

Trench jacks or cribbing are normally required in deep trenches or when crossing old excavations. Governmental units primarily concerned with safety have become quite disturbed about this matter in recent years and are exerting pressure on municipalities to write specifications which require bracing for all trenching. Many engineers feel, however, that this should be left to the discretion of the inspector who could eliminate bracing in many cases without affecting the safety of the operation.

A number of papers have been written on methods of backfilling the trench and they express nearly as many different opinions. One paper, based upon an actual field experiment in a northern location, used a very scientific approach to the compaction problem and concluded that the best method from the standpoint of cost, degree of compaction, etc. was the use of a sand and gravel backfill. Some of us made the same mistake a few years ago but we didn't make it very scientifically. We have learned since, however, that the high degree of compaction of the granular backfill is of little value as far as a smooth surface is concerned, if the native soil adjacent to the trench is apt to swell during wet weather or heave when frozen. In areas where the soil is basically granular, sand and gravel backfill is undoubtedly a positive solution since it is easily compacted by flooding or by relatively little tamping.

Most of us are faced with somewhat more difficult conditions, however, and must resort to mechanical compaction of the native soil. Some use a granular backfill in deep trenches to a level just below the frost penetration (often 5 feet from the surface) and backfill the remaining depth with the native soil. This method, combined with the use of a 1,000-lb. hydro-hammer, will reduce the compaction cost to a minimum. The degree of compaction by this equipment at depths greater than 4 to 5 ft. is as yet somewhat doubtful, but many feel it is safe to assume that such a ma-



● **SETTLED** concrete patch resulted primarily from poor compaction of the trench backfill. The edges of the patched area are sheared from the settlement of about 2½ inches.

● **RESULT** of a typical so-called "temporary" bituminous patch in a concrete surface. Many of them remain forgotten unless administrative procedures are established for control.

● **REPAIR** as made for these utility boxes is an example of very poor work. The hole was not squared out for the patch, and the quality of the patch made is below standard.

● **CONCRETE** patches in an asphaltic surface on a concrete base are undesirable from standpoints of appearance and uniformity of riding surface. And seal-coating is difficult.

chine will adequately compact a 5 foot lift under normal soil conditions. This would depend, of course, upon the type of soil, moisture content, weight of the hammer, height of drop and number of passes. The use of this type compactor does have its limitations since it could not be used over a Transite or clay pipe with shallow cover (the exception rather than the rule in areas where the pipe cover must be sufficient to prevent freezing). Field studies have been conducted in past years to compare the effectiveness of various types of equipment under different soil conditions but new compacting equipment has been developed since most of these studies were made. The effectiveness of these machines employing the use of a large hammer with an 8 to 10 ft. drop is yet to be determined.

Some engineers still rely on the so-called "button head" attachment on a pneumatic tamper which request a 6 to 8 in. lift. This method is a positive one but requires considerable time including inspector time. Many a trench has been carefully backfilled with a hand shovel and pneumatic tamper while the inspector was present — and completed with the backhoe after he left the job site.

A few engineers have arrived at a solution by simply avoiding all specifications as to methods and equipment and, instead, requiring an "end result." This type of specification is fine for a construction job but is far from practical when involving a number of small job sites.

The backfill problem cited earlier in the hypothetical case is one which defies a positive solution. The top 5 feet of native soil placed during the winter months is just a loose fill after the frost leaves the ground. It must either be removed and compacted in thin layers with a conventional compactor or left in place and compacted from the surface by use of a heavy drop-hammer. Many use a 1,000-lb. hydro-hammer to compact this layer but cannot be sure of the degree of compaction 4 to 5 feet beneath the surface. The writer has suggested that the Minnesota State Aid Research Committee conduct studies of this problem, since it is an unknown quantity for public works officials at all levels of government.

Surface Patching

Patching of concrete surfaces is very well covered in Part II of *Maintenance Practices for Concrete Pavement*, a pamphlet published by the Portland Cement Association. Both concrete and bituminous patching are ably discussed in *Patching Pavements Properly* by George E. Martin, published in the June, 1953 issue of PUBLIC WORKS. Let us briefly review, however, the basic principles involved when patching either a concrete surface or a bituminous one.

Prior to pouring a concrete patch, the edges and bottom of the hole should be dampened to improve the bond and reduce the absorption of water from the new concrete. A high-early cement is also desirable to reduce the curing time. Concrete

with a slump of approximately 1½ inches, although difficult to work, is required to reduce the shrinkage. The surface of the patch should be screeded slightly above the old surface and then reduced to the proper level by floating after the concrete is partially set. Joints in the existing surface which intersect the patch should be extended through the patched area.

The material used to lay a bituminous patch should be similar to that in the old surface, especially if an asphaltic concrete paving is involved. The sides of the hole should be given a thin coat of cutback asphalt, such as RC-1, to seal the joint between the old and new material, after which the patch material is raked into the edges. An experienced crew will know just how high to mound the material to obtain a flush, compacted surface. Some foremen prefer to pour a thin stream of bituminous material over the edges of the completed joint to seal it. This is hardly necessary if the edge of the hole was well coated prior to placing the patch material.

General Considerations

Several model ordinances controlling street excavations have been prepared in recent years. They do not generally include detailed specifications for the actual restoration but cover the control aspect very thoroughly. An ordinance prepared by the Southern California Chapter of APWA includes such items as preservation of monuments, control of noise and dust, clean up, protection of watercourses, abandonment of substructures, routing of traffic and maintenance of drawings. Another prepared by the University of Pittsburgh Institute of Local Government includes an appendix of suggested permit and inspection forms. This ordinance imposes a penalty on any person requesting a permit to excavate during the 5 year period following improvement or surfacing of the street — except where public health and safety require that the street be opened.

All urban municipalities in Minnesota are now receiving a direct share of the state gasoline and auto license tax. The legislation which brought this about in 1957 was based upon the theory that arterial street systems should be improved by good maintenance as well as new construction. In addition to the municipal state aid allocation, many cities complete minor maintenance on state and federal highways under contract with the state — usually on the basis of a fixed price per mile. The municipalities, by accepting these funds and contracts, have also accepted the obligation of providing a higher quality of maintenance than they were previously able to afford. Better equipment, research on compaction results, high-grade supervisory personnel, revision of obsolete specifications and ordinances, and fixed responsibility are things which would bring about a marked improvement.

This is a condensation of a paper presented by the author at the League of Minnesota Municipalities Public Works Conference in March, 1960.

3 MG All-Steel Tank

A CONTRACT has been awarded for design, fabrication and erection of a 3 million gallon elevated steel tank for water storage by the City of Sacramento, California, to Chicago Bridge & Iron Co.

CB&I officials believe the spheroidal-type structure will have the largest capacity of any all-steel elevated tank in the United States. It will be 77 feet to bottom and is designed for a six percent earthquake factor. Diameter of the tank shell will be 126 feet with a range in head of 35 feet; the center riser is 6 ft. in dia.

Radioactive Pollution Survey

(*Continued from page 97*)

anium deposits. Experience with mills of this type indicate that stream pollution from their wastes may be a problem.

Surveys of some streams below uranium mills have indicated concentrations of gross radioactivity and soluble radium in excess of currently accepted maximum permissible amounts. (5) Fortunately, most of these mills are located in rather remote areas and the pollution does not constitute a serious health hazard. In Karnes County this would not be the case.

A final source of radioactive waste to be considered is that of medical, industrial, and research application of radioisotopes. This program has shown a phenomenal growth since its inception in 1946. Through 1959, over 900,000 curies of these materials had been nationally distributed by the Atomic Energy Commission. During the first seven months of 1960 approximately 128,000 additional curies were shipped. Texas currently ranks fourth among the states in the application of these radioactive materials. It should be pointed out that most of this material is used in the form of sealed sources and it is very unlikely that it would ever be a source of stream contamination. However, the use of these radioisotopes provides another source of wastes which will require close surveillance in future years to prevent possible problems.

In addition to radiation the Atomic Age has focused an interest upon many heretofore relatively rare materials. Lesser known metals such as beryllium and zirconium, have found unique applications in this field. Some of these substances are known to be toxic; the toxicity of others is yet to be determined. Conservatism will be in order until the effect of these wastes upon our waters can be established.

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WATER and SEWAGE NEWS
No Chances Taken In Making Denton Drinking Water Safe
Sewer Water Re-Use Pondered by Officials
Water, Sewer Meet August 18
C. A. Bode of Ore City Gets Water Plant Award

How Routine Work of Utility Men Can Make the News

SAM L. WARRINGTON
Chief of Operators' Advisory Programs,
and
G. H. BURTON
Health Education Division,
Texas State Department of Health

MISS AUTHALA WILLIAMS, a chemist with the Denton, Texas, municipal water treatment plant, is a minor heroine in her home town. No, she didn't do anything new or unusual. It's just that someone told the people of Denton about her daily routine, how hard she tried to be a good public servant and what her work means to their health and welfare.

It all began last July when Miss Williams qualified for a Grade B certificate of competency under the Texas State Department of Health's program of operator certification.

Some months earlier, the Texas Water and Sewage Works Association, distressed by the lack of public appreciation for the work done by water and sewage works men, had contracted with an Austin public relations firm to mail releases, on certification winners to local news media. When Miss William's approved certificate came through, the firm instantly recognized the human interest aspects of a woman proving herself in a predominantly male field. Accordingly, a note to the city editor was attached to the routine release which went to the Denton *Record-Chronicle*, suggesting that Miss Williams would be most cooperative if a photographer and feature writer were sent to interview her.

The city editor's interest was aroused. A 1500-word story and two 3-column pictures of Miss Williams at work in her laboratory were the results. Since then other features and pictures of the chemist and her work have appeared until the Denton municipal water treatment plant has assumed a new importance in the minds of the people it serves. Plant personnel who formerly didn't know a city editor from a typesetter are now on a first-name basis with editors and reporters and for

the first time in its history the plant is getting the recognition it deserves.

Why should not the important work of water and sewage works operators be brought to public attention more than it is? The stock answer seems to be that these jobs are too prosaic and of no interest to anyone other than operators themselves.

But, as the song says: "It ain't necessarily so. . . ." Two years of experience in Texas show conclusively that other people are interested and that managers of news media welcome valid news on all phases of city utility operation if the material is handled in such a way as to make it easy to use.

In a recent survey of releases on Texas Water and Sewage Works Association members and of releases recovered by an Austin clipping service, it was found that 55 percent of the material had been printed—most of it in favorable positions in the papers. Considering the items missed by scanners and items printed on the back of material clipped for other accounts, the percentage could be conservatively estimated at considerably more.

For years the Texas Water and Sewage Works Association had tried, always unsuccessfully, to conduct a meaningful public relations program for its members. Each year the current president would name a Public Relations Committee. Each year committee members, without funds for help and themselves incapable by reason of lack of time or talent to proceed on their own, floundered in a mire of well-intentioned platitudes.

Things changed two years ago when committee members decided to present their case at an Association business meeting and ask for money to hire professional help. J. E. Williams, superintendent of the San Angelo water department and then president of Texas Water and Sewage Works Association, was largely responsible for getting $1,200 allocated for a one-year trial run of the service.

The question was how to buy the most public relations for that limited amount. A committee was named to come up with the answer. Its membership was: L. W. Smith (chairman), water superintendent, Temple; Henry Wilkens, engineer, Houston; I. J. Benedict, engineer, San Antonio; C. C. Cason, El Paso Public Service Board; J. R. Hennon, water superintendent, Port Neches; R. O. Gresham, editor-business manager, *Southwest Water Works Journal;* and Henry J. Graeser, water and sewage superintendent, Dallas.

Trying to set up a public relations campaign for a group of independent thinkers like water and sewage works men is a little like trying to push a wet noodle—unless the approach is chosen very carefully. Such men are altogether too modest, too self-reliant, too accustomed to "making do," to be overwhelmed with the idea of getting their names or their pictures in the paper. J. E. Williams summed up the problem when the committee first approached him about P/R funds. Williams said he realized the necessity of a good P/R campaign, but "generally speaking, water and sewage works men are not publicity minded."

Creating a favorable "image" is being emphasized by the national organizations in their public relations efforts. This state organization has found a ready-made image—the certified operator.

Members of the committee were very much aware of this attitude. They were aware, too, that you can buy as much public relations as you can afford, and that, with their meager appropriation, they could afford only a little. They finally decided to limit the promotion to persons receiving a water or sewage works certificate of competency and to persons scheduled to appear on the program of either the annual state-wide short school for operators or the regional schools, five of which are held each year in various parts of Texas.

Altogether, under this scheme, some 1500 people would be the subject of a carefully prepared promotional release each year—approximately 1200 by virtue of winning certification and 300 because of short school faculty participation.

The plan was presented to three public relations firms for estimates of cost. The estimates were very similar—slightly less than $1.00 per potential release subject. None of the firms quoted extra charges for more than one release on the same subject, as in the case where a local community has several radio stations, TV stations and newspapers.

The releases began moving in August, 1959, and have been flowing steadily each week since. The simple mechanical details of the operation go like this:

Application forms on all persons to whom certificates of competency are mailed during any given week are picked up on Friday of that week at the State Department of Health by the P/R firm. The number of weekly applications varies from perhaps 15 to as many as 100, depending on how many operators have passed examinations for certification in their category.

Each certificate winner is treated in as many releases as is necessary to mail one to each news outlet. When there are two or more certificate winners from a single town they are all named and identified in a single story. Releases are addressed to the "city editor" of dailies, the "editor" of weeklies, and "news director" of radio stations. When all applications have been handled they are returned to the State Health Department for filing.

In the Texas situation it has been found that the use of window envelopes tends to expedite the addressing mechanics considerably. The typist has merely to turn the release sheet over, replace it into the typewriter and enter the proper address. The Texas Water and Sewage Works Association furnishes envelopes, but the P/R firm provides copy paper and postage. All releases are sent by first class mail.

Since all releases on certificate winners are the same, except for name and job title, it has been possible to photo-reproduce them in quantity. This saves the necessity of having to type a complete story on each certificate winner. The original story for photo-reproduction, with spaces left for later entering names and titles, was typed on the same typewriter that is used to complete the releases. By so doing, releases have the appearance of personalized stories.

Items concerning short school lecturers cannot be handled like this because most lecturers are highly-placed specialists in their own communities—city managers, consulting engineers, departmental superintendents, etc.—who merit more than routine releases. Also, titles of their lectures are usually worth writing into the story, but can be properly incorporated into the item only by writing each one separately. But, like the certificate items, speakers from the same town are grouped.

The text of each release—whether about certificate winners or about the short schools—stresses the importance of water and sewage works operations to the community health and welfare, and that plant personnel seek certification and attend the

short schools on their own time, at their own expense, as a means of advancing themselves professionally and to increase their efficiency as public servants. In no known instance has an editor failed to include that line in the story which appeared in print. Indeed, it is very rare when the story is not printed verbatim in its full text.

Releases are scheduled for mailing on Monday. This means they will be delivered in most areas of the State on Wednesday, which gives Thursday-published weeklies an even break with the dailies.

Weeklies should never be ignored in campaigns to create favorable images of local plant operators. Dailies should not be ignored either, of course, but most weeklies get close to 100 percent readership, whereas sophisticated dailies get much less. Better positions are likely in weeklies, which fulfill a vital task of reporting community affairs on front page headlines.

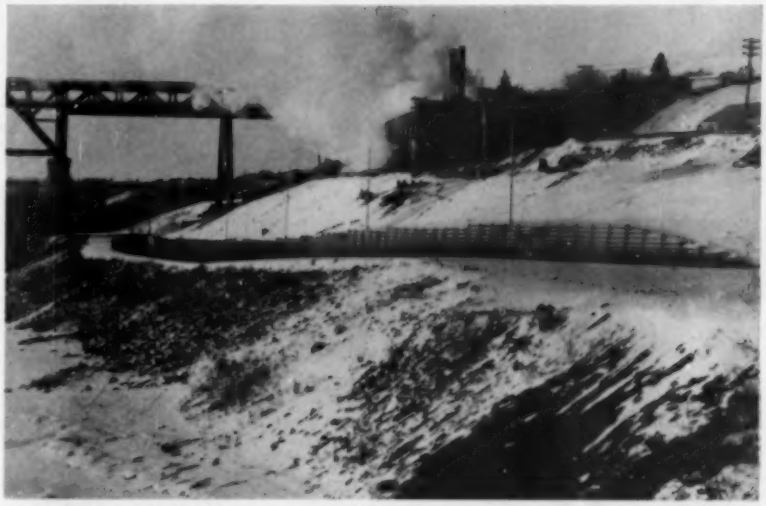
Down through the years newspapers have evolved a well-defined style of writing based on reader habits. When promotional material is adapted to this style it obviously has a much better chance of being used because it saves the newspaper staff the trouble of having to re-write it. Adherence to this style, and always being objective and accurate, has contributed much to the success of the Texas Water and Sewage Works Association campaign.

Continued acceptance by news media of campaigns like this demands that the pattern be altered in small ways from time to time to keep it fresh. Changing the form of releases to accentuate various features of water and sewage plant management is an example.

Also, it is very often productive to append a note to the editor suggesting investigation of a feature angle. This one technique has been responsible for more Texas water and sewage plants becoming part of a newspaper reporter's regular "beat" than anything else.

Now for the big question: Has the P/R campaign, limited as it is, been worth the investment? Practically every operator in the State will heartily agree it has. Further proof: Money for the second year of operation was voted without a single dissenting voice being raised.

Editor's Note—A source of many more news items will be the 43rd annual short school sponsored by the Texas Water and Sewage Works Association to be held at College Station, Texas, March 12 to 17.



● **RETAINING wall 1170 feet long serves first stage of grade separation and approaches to new river crossings. Later another road will be located above this one.**

Expressway Design Fits Valley Restrictions

W. E. GILLESPIE

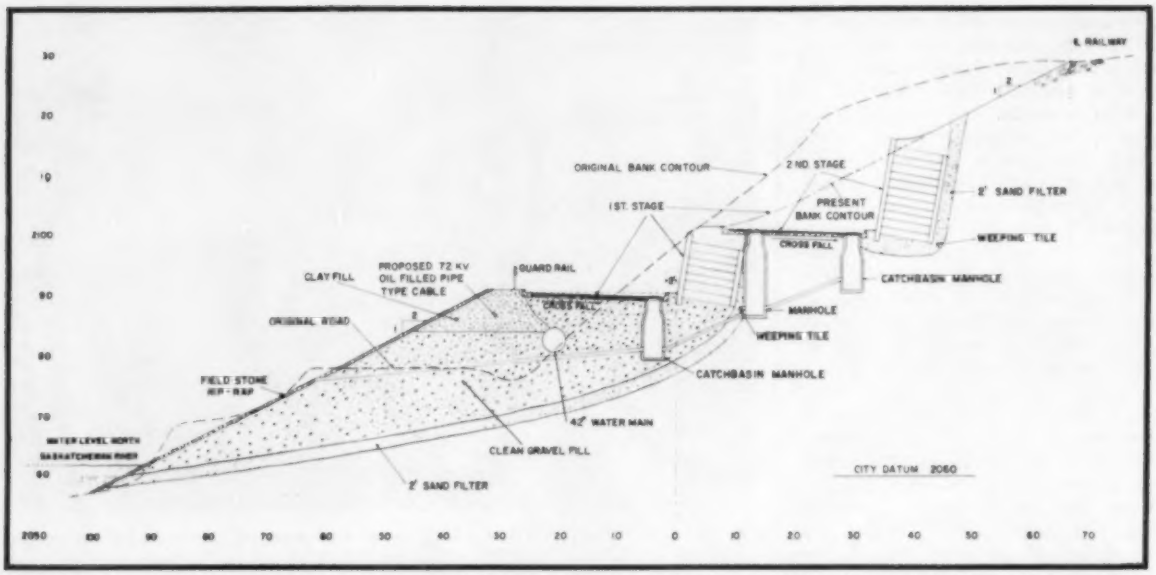
Roadways Design Engineer, City of Edmonton, Alberta, Canada

THE RAPID population growth of Edmonton has necessitated the construction of roadways which will meet not only the needs of today's vehicular traffic, but can be readily expanded to meet future needs. It is expected that in 15 years the population within this 56-sq. mi. city will grow from 300,000 to more than 600,000. Therefore, allowance for future needs in construction is essential if Edmonton is to achieve a steady, orderly growth and not be handicapped for lack of an adequate transportation system.

As the first step in this program, an intensive study of Edmonton's cross-river traffic problems was made by Stanley, Grimble, Robin, Ltd., in 1956. The completed report showed that by 1965 four new bridges and approach systems, as well as improvements to the five existing bridges and their approaches, would be needed if the free flow of cross-river traffic was to be maintained. It was further recommended that a freeway system be developed in the North Saskatchewan River valley that would link the existing and proposed cross-river facilities with feeder roads leading out of the valley.

Accordingly, grade separations and interchanges to the aproaches were constructed in 1956 and 1957. A two-mile expressway connecting the Low Level Bridge to the east with the new Groat Bridge to the west was completed in 1959. Identified as the Lower Road, this 2-lane highway is the first stage of the project. When traffic conditions require it, a second road will be constructed parallel to and above the existing road. A portion of the River Valley Freeway lying between the 105th Street Bridge and the High Level Bridge presented design and construction problems due to topography, drainage and soil conditions.

The power plant supplying the Alberta government buildings was situated on a shelf at the top of the river bank. The area just below the shelf had a long history of slides and settlements. It was over this area that the new expressway was to pass. Tests by R. M. Hardy & As-



● **SECTION through project showing ultimate development. Future road at upper right; detail of fill construction at left.**

sociates, soils consultants, showed that while the power plant was on stable material, ground water was being led via coal and sand seams to the valley bank .This water, together with surface runoff, kept the surface material of the slope in an unstable condition and was responsible for the slides and failings.

Upon the recommendation of Hardy & Associates, all unsuitable and soft materials were removed and replaced with a clean gravel fill on a 2-ft. sand blanket filter. This enabled the entire embankment to act as a drain, with the sand blanket filter preventing fines from the bank from being led into the fill to impede the free flow of water. The surface of the gravel fill was protected from the river erosion and ice damage by a heavy rip-rap of 100-lb. minimum fieldstone and boulders.

Armco bin-type retaining walls were used to stabilize the embankment and prevent bank erosion. These are gravity type retaining walls assembled from prefabricated parts. The stability of the walls comes largely from the weight of the fill confined within the bins. Resistance against sliding was provided by the friction of the confined fill on the foundations and by extending the wall into foundation material. In this case the bins were filled with the same granular material that was used for the embankment. A clay cap 5 ft. in depth was placed on top of the fill to economize on gravel, stabilize the shoulder of the slope and to facilitate the future placing of a 42-in. water main and a 72 KV power cable. The wall is 1170-ft. long and up to 13.33-ft. high. Drainage from this wall was provided by the sand blanket and by weeping tile placed longitudinally behind the base of the wall.

Prior to construction, four piezometers were installed at strategic locations and elevations to assess the effectiveness of the drainage systems. Recent readings indicate that the water problem is under control and all indications point to the successful stabilization of the bank.

At the present time, Edmonton in cooperation with the Edmonton District Planning Commission is conducting a comprehensive traffic survey of the metropolitan area. The purpose is to evolve a plan of arterial road systems, downtown parking, one-way streets and mass transportation systems which will serve as a master plan for future work.

● **BIN WALL construction was carried on simultaneously with backfilling. Material was placed in 6-inch layers and well tamped to minimize settlement. For drainage, fill material contained much granular material, 3-inch maximum.**

A LOOK AT EUROPEAN COMPOSTING

JOHN S. WILEY
Sanitary Engineer Director
Public Health Service

● **ALMELO, the Netherlands, plant employs the rasping system. Building at left, rear, is receiving; in center is processing plant; windrows are shown in foreground.**

THE composting of domestic wastes has "gone to college" in Europe, where there are literally scores of municipal composting plants, many governmentally supported. There is little commercialization, perhaps no more than sewage treatment is commercialized in the U. S.

Indications of the interest in composting are the number of plants; the cooperation between agricultural, public health, and public works officials; and the extent of specialized equipment developed for refuse handling, sludge dewatering, and composting. For example, 20 Dano egsetor (grinding-screening) plants were built in Europe, generally from 1938 to 1955, and 24 Dano biostabilizer plants have been built or placed under construction since 1953 (32 world-wide). In the Netherlands alone, there are 13 compost works serving 22 cities with a population of 1.7 million and treating about 25 percent of the total municipal refuse by three different processes.

An International Congress on Disposal and Utilization of Town Refuse, was held in 1959 at Scheveningen, the Netherlands. It was attended by 200 participants from 22 nations. The author was fortunate in attending this Congress and in later visiting 17 composting plants in 6 European countries.

Reasons for Composting

Reasons for composting are threefold, varying with each country as to importance: sanitary waste disposal, agriculture and economy. As the Netherlands is probably the leader, it might be interesting to review her experiences (1) (2) (3). Composting had been practiced for centuries, but the great success achieved with chemical fertilizers decreased interest in organic manures after 1900. Compost from town wastes became almost unsalable, and the cities resorted to other methods of waste disposal, largely open or burning dumps. Although crop yields increased, it was found later that greater amounts of fertilizer failed to produce further yield increases. It was then believed that the soil showed physical fertility deficiencies due to a decreased humus content.

After 40 years of high chemical fertilizer-low organic manure use, the pendulum swung back to organic manures and compost production from domestic refuse to increase humus content, water- and air-retention capacity, trace elements, buffering capacity, and ability to support beneficial biological activity of the soil. In 1929 the V.A.M. (Refuse Disposal Company), a nonprofit and semi-official institution, was founded by the government with government capital to develop composting methods and equipment and to construct and to operate composting plants. When plants are built by V.A.M., the company receives funds from municipalities for waste disposal and from farmers and industry for the sale of compost and salvaged materials. However, the newer plants are generally owned by a city rather than by the V.A.M.

In 1952, the government-sponsored Stichting "Compost" (Compost Foundation) was formed to stimulate further sanitary waste disposal and to conduct research on refuse disposal and compost utilization. The Ministry of Agriculture, on recommendations by the Compost Foundation, issued 10 million guilders ($2.67 million) of Marshall Plan funds as interest-free loans to municipalities for refuse disposal plant construction, especially by new or improved methods of waste conversion. There was (and is) free competition between all methods of municipal refuse disposal; however, all the money was obligated within a short time, for 8 composting plants.

While primary motivation in the Netherlands has been soil improvement, sanitation and water pollution control are stressed in tourist-minded Switzerland and Germany. The Swiss and Germans discourage the landfill method because of pollution hazards to either surface or ground waters. Thus, composting competes mainly with incineration and is usually less expensive for cities under 100,000.

Compost has not replaced chemical fertilizers, instead the two complement each other. Fertilizers are generally applied yearly; compost is applied only every three or more years to a given area.

Present day composting of organic wastes is the biochemical decomposition of the putrescible matter by aerobic thermophilic microorganisms. The process is both oxidative and thermogenetic.

Most municipal composting plants in Europe utilize either refuse or refuse and sewage sludge, the latter being either raw or digested. Refuse refers to combined domestic and

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commercial wastes, including garbage, rubbish and ashes. European refuse is generally much higher in ash content and much lower in garbage, paper, metal and glass content than U. S. refuse, although the average total weight produced per capita is about the same. In most areas winter refuse contains in excess of 50 percent ashes, and some plants compost only the summer refuse. The first step is often screening to remove fine dust and cinders. The fine dust is stored and later reintroduced to absorb sludge moisture, while the cinders are sold or used as fill.

Sewage sludge is preferred to water as a moistening agent, but neither raw nor digested sludge can be mixed with the refuse from an equivalent population as it comes from the tanks. This is because the resultant mixture is too wet for composting. Some plants apply only enough wet sludge to give the optimum moisture; some others use only air-dried digested sludge. Baden-Baden thickens the sludge, while Enschede centrifuges it to reduce moisture content. Dantumadeel composts raw night-soil and refuse at a new installation. Kirkconnel composts raw sludge with refuse and/or straw. Some European plants also include food processing or agricultural wastes.

Generally no bacterial cultures or inoculants are employed. The high time - temperatures (10) and the antibiotic effects (11) are credited with the destruction of flies and other vermin, weed and volunteer seeds, worm eggs, and human, plant and animal pathogens.

While there is some argument, the consensus is that compost is not a fertilizer but a soil builder or soil amendment, having values far in excess of those based on its N-P-K contents.

Composting Processes

Although there are many "systems" of composting municipal wastes, they all may be generally classified into three process types:

1) Open windrow, pile, or ventilated bin or pit composting with turning.

2) Composting in ventilated cells or units with intermittent disturbance.

3) Composting in mechanical units with continuous mixing and positive aeration.

The primary objectives of all processes are the same: to provide optimum particle-size, pore-space, moisture, and other environmental conditions conducive to aerobic decomposition; to mix, reaerate, readjust moisture, and gradually reduce particle size during active composting; to cure or mature the product so as to meet public health requirements. Secondary objectives are to render the compost free of shards, glass splinters, bits of metal, etc., and to render it suitable and beneficial for agronomic use. Thus, the refuse must be sorted and ground either before, during, or after the composting or curing.

The Windrow Process

The windrow process is conducted in open air and relies on natural ventilation plus occasional turning to insure aerobic conditions. It may be accomplished in windrows, piles or ventilated bins or pits, either outdoors or under shelter. Turnings are accomplished usually with the aid of a front-end or conveyor-type loader or a traveling or crane grab.

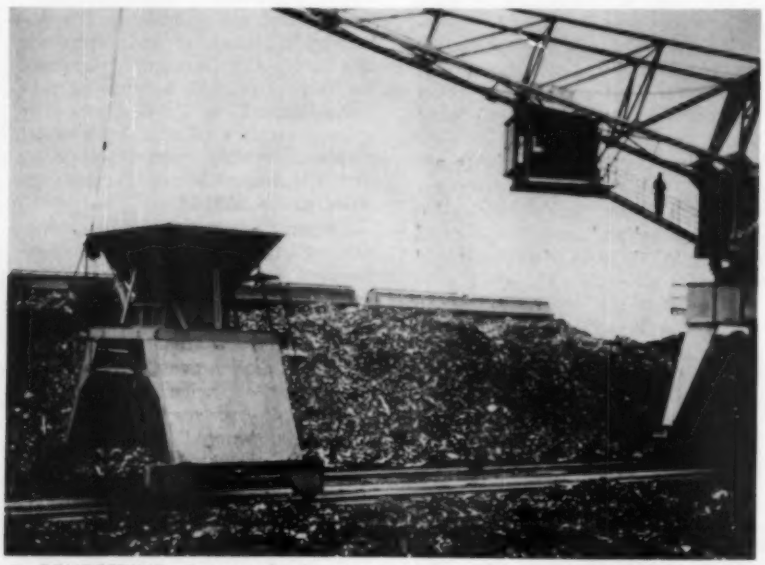
The van Maanen Process. The two largest European composting plants are of the van Maanen type, operated by V.A.M., and located at Wijster and Mierlo, the Netherlands. Refuse is conveyed by specially designed railroad trains from the Hague and other distant cities and by truck from nearby cities to these two isolated plants, serving about 700,000 and 400,000 population, respectively. The unprocessed refuse is merely wetted and decomposed in huge windrows for a period of 4 to 6 months with one turning by large grab cranes. The compost is then processed by screening, magnetic separation, grinding, and gravity and/or ballistic separation. The Wijster plant was constructed in 1932, while the Mierlo plant was built in 1955 and has more modern processing equipment.

The Mierlo plant processes 70,000 metric tons/yr., producing 45,000 tons/yr. of compost and 1,400 tons/yr. of baled iron. The plant handles 40 tons/hr. of refuse, producing an agricultural compost selling for about 4 guilders ($1.10)/ton (passing 20 mm. screen) and a horticultural compost at about 12 guilders ($3.30)/ton (passing 6 mm. screen).

Principal equipment items in the compost processing plants are: steel apron conveyor, vibrating screen (20 and 30 mm. perforations), bar screen (4-in.), electromagnet, baler, rasping machine, secator (gravity separator), ballistic separator, roller crusher and appurtenant belt conveyors.

Odor, fly and rodent problems exist at the composting site because, after all, the "composting" occurs in windrows of untreated refuse, even though the interior temperature sometimes exceeds 170° F. The returning trains also carry flies back to the Hague.

Transportation (200 km. or 124 mi. from the Hague to Wijster) costs are rising and the Hague estimates 1962 hauling costs will be 9.87 guilders ($2.72)/ton (12). Estimates show that this cost is in excess of the net incineration costs of 7.08 guilders ($1.95)/ton after deducting 7.95 guilders ($2.19)/ton for steam and power supplied or sold and 0.74 guilder ($0.20)/ton for sale of scrap iron and ashes (12). Because of these factors, it is probable that the Hague will switch to incineration in

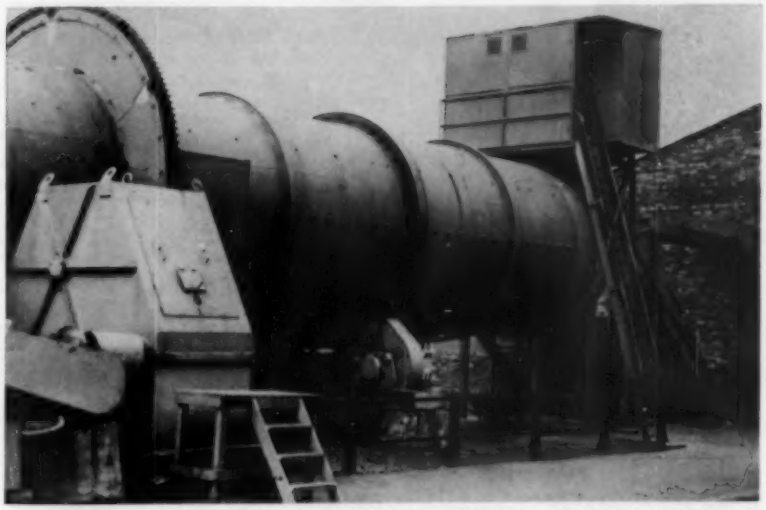


● **COMPOSTING of unsorted refuse is practiced at Mierlo, the Netherlands, using the van Maanen system. Refuse train in background; truck loading hopper foreground.**

1962. (Dr. Schaafsma notes (12), however, that the incinerator costs estimated are much lower than those in Swiss cities and in Brussels, and also that rail transportation of 100 km. would cost the same as incineration based on the city's estimates for these disposal costs.)

The Rasping System. The rasping system (Dorr - Oliver Refuse Treator) provides initial sorting, grinding, roller crushing and ballistic and/or gravity separation of the refuse, followed by windrow composting, generally with turning, for 3 to 5 months. Principal features of these plants are the V.A.M.-developed rasping machine and ballistic separator (also Dorr-Oliver).

Screening is sometimes used initially to separate ashes or finally to refine the compost. Most plants sort out and bale paper, rags and ferrous metals for salvage. Receiving bins generally taper from 8-10 ft. wide at the top to 3 ft. at the bottom. This design often permits arching or bridging of the refuse resulting in non-functioning of the apron conveyor. The picking belt is usually a plain or cleated belt. Magnets are mostly of the electromagnetic overband type with transporting belt for metals. The rasp provides grinding or grating through perforated plates, while the roller crusher is provided to reduce the particle size of glass, cinders, and other brittle materials. The ballistic separator flings all particles horizontally at high speed, segregating the more dense and resilient particles from the softer organics.



● **COMPOST plant at Edinburgh, Scotland, see Edinburgh (a) in table below, employs Dano method, and has a capacity of 20 metric tons per day, serving 27,000.**

Windrows are of various sizes, usually trapezoidal in cross-section and varying in height from 5 to 10 feet. They are generally outdoors on an impervious surface. The Dutch scheme is to compost 6 weeks in the original windrow, turn once, and compost another six weeks. They usually place the windrows by dump truck, turn with a front-end loader, and load finished compost with the same loader. This turning device does not always provide good mixing, aeration, or particle-size reduction.

At Heidelberg, windrows are placed by means of a long, horizontal pivoting conveyor in concentric

Table 1—European Refuse Composting Installations Visited in 1959

City and Country	*Process*	*Sludge Added*	*Population Served*	*Capacity tons/day(x)*	*Plant Steps**
Mierlo, Neth.	van Maanen	None	400,000	270	9,5,3,4,8,7
Delft, Neth.	Rasping syst.	None	70,000	50	1,3,4,7,9
Hengelo, Neth.	Rasping syst.	None	60,000	50	1,3,4,7,9,3
Almelo, Neth.	Rasping syst.	None	50,000	30	1,3,4,7,9
Heidelberg, Ger.	Rasping syst.	None	60,000	50	1,3,7,9
Baden-Baden, Ger.	Baden-Baden	Digested	60,000	40	6,9,6
Uzwil, Switz.	Buhler syst.	None	9,000	5	2,5,4,9
Kirkconnel, Scot.	Dumfriesshire	Raw	5,000	4	6,1,2,12,5
Jersey, C. I., Eng.	Jersey syst.	Digested	57,000	60	6,1,2(y),3,11,9,7
Soest-Baarn, Neth.	Dano method	None	45,000	30	1,10,5,8,9
Enschede, Neth.	Dano method	Digested	122,000	75	1,2(y),10,6,7,9
Duisburg, Ger.	Dano method	Digested	140,000	80	1,5,10,5
Bad Kreuznach, Ger.	Dano method	None	30,000	30	10,5,9
Chur, Switz.	Dano method	None	23,000	18	5,10,9
Edinburgh(a), Scot.	Dano method	Digested	27,000	20	(z)10,5
Edinburgh(b), Scot.	Dano method	Digested	190,000	140	5,1,10,5,8
Calais, France	Calais syst.	None	60,000	80	6,2,9

*Each of above plants provides magnetic separation of ferrous metals.
(x)Metric ton (2205 lb.) on the Continent; long ton (2240 lb.) in Great Britain.
(y)Hammermilling of a portion only.
(z)Refuse had been pre-separated.

Legend for Column 6, Plant Steps:

1 Sorting with salvage
2 Hammermill grinding
3 Rasp machine grinding
4 Roller crushing
5 Vibration screening
6 Drum screening
7 Ballistic separation
8 Gravity separation
9 Windrow composting
10 Dano composting
11 Tower composting
12 Pit composting

Table 2—Construction and Operating Cost Data (Converted to U.S. Dollars and Short Tons)

Process	Location	Refuse Capacity, tons/day	Capital Costs: Dollars per Person Served	Capital Costs: Dollars per Ton Refuse Capacity[f]	Gross Annual Operating Cost[a] Dollars/Ton	Income, Dollars: Compost Price per Ton Ex Works	Income, Dollars: Salvage Price per Ton Refuse	Net Ann. Oper. Cost Dollars/Ton Refuse[a]	Electric Power Required, kwh per ton
van Maanen	Mierlo	300	1.38	1,833	1.55	1.00	0.28	0.62	3.6
Rasping syst.	(composite)[b]	50	2.80	3,400	3.90	3.00	0.32	1.15	8-9
Jersey	Jersey	67	10.46[c]	8,900	2.47[c]	3.00	0.20	0.69[c]	..
Dano method	Enschede	82.5	...	...	3.95	1.46	0.24	2.44	8.15
Dano method	Duisburg	88	2.54	4,057	...	1.89	...	...	18
Dano method	Edinburgh	22.4	3.73[d]	4,500[d]	...	4.38	...	...	..
Calais	Calais	88	10.15	9,227	1.00[e]	3.00	...	...	6-7

[a]Includes amortization. [b]Based on average figures from plants at Delft, Hengelo, and Schiedam. [c]Does not include some 35,000 tourists in season. [d]Does not include pre-separation. [e]Excludes amortization. [f]Daily capacity.

circles. They are turned by a self-propelled, conveyor-type windrow turner that appeared to give good mixing, aeration, and particle-size reduction. Heidelberg turns windrows 2-4 times, and minimum composting time is 3 months. Generally, temperatures peak at 160° F. in windrow composting and exceed 140° F. for several days, as well as after each turning.

The Baden-Baden System. Baden-Baden provides only a rotating screen for preparation of refuse and a mixer for incorporating thickened sewage sludge (about 90 percent moisture) after short-term digestion. The sludge—refuse ratio is 1:3.5 or 4.0. Large windrows, 10 ft. high x 28 ft. wide, are centered over large, perforated pipes to assist aeration. Windrows are turned after 8-10 weeks and then covered with temporary shelters for the rest of the 5-month composting period. The final compost is screened again.

The Bühler System. The Bühler system plant at Uzwil employs no sorting but grinds refuse immediately in a hammermill. It then passes to a permanent magnet separator, vibrating screen, roller crusher, and windrows. The conveyors for ground refuse are of the enclosed, flight type, transporting around corners and at any angle. Two or three turnings are made at Uzwil with either a dragline or front-end loader. The composting time is 2-3 months.

The Dumfriesshire System. The Kirkconnel plant, Dumfriesshire, Scotland, composts raw sewage sludge with refuse and/or straw in pits provided with ventilation and drainage. Refuse is screened in a rotary drum screen, sorted by hand and magnetically ground and then conveyed by hand-pushed rail cart to the composting building. Prepared refuse, dust (screened from the refuse), sewage sludge, straw and ground limestone are layered in mixing bays, and the wet sludge is added to the top of each layer. The refuse or straw filters solids from the sludge. The filtrate then is returned from an underdrainage system to the adjacent sewage treatment plant. Materials are crudely mixed with a fork and remain in the mixing bays for 4-7 days. Temperatures reach 135° F. and moisture is reduced to about 70 percent. A traveling grab transfers materials from mixing to composting pits, where composting continues for six weeks. Temperatures exceed 165° F. during the first week the material is in the pits. The grab then transfers compost to floor level where it undergoes several additional weeks of curing, then final screening and bagging.

Ventilated Cell Composting

This general process involves composting in progressive cells or units provided with ventilation, either natural or forced, and with intermittent disturbance (mixing and reaeration) as the material drops from cell to cell. It usually involves a multi-story building, with each story containing one or more cells. Examples in the U. S. are the Frazer-Eweson process (no longer in use), the Williamston, Michigan, process (also known as the Riker process), and the Naturizer process (at Norman, Oklahoma).

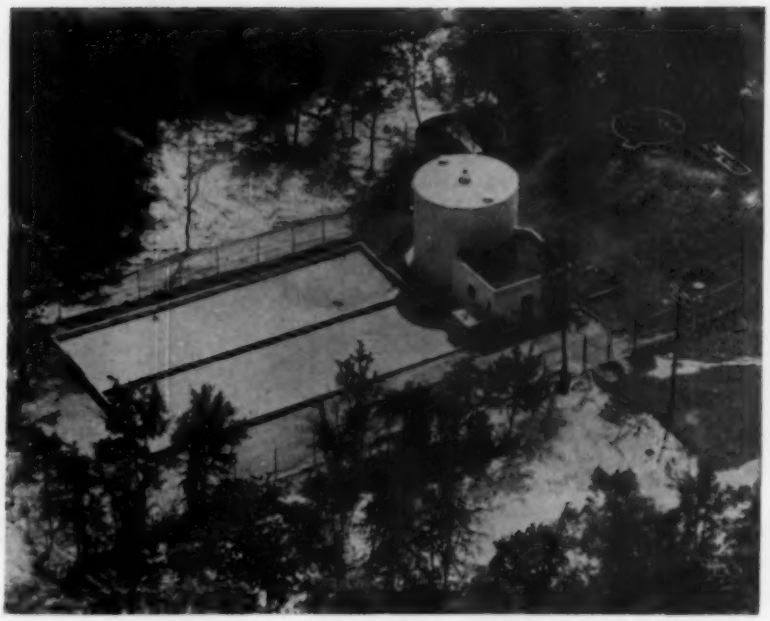
The Jersey System(13). The plant on Jersey, Channel Islands, England, is designed to compost refuse and sludge. However, the sewage treatment plant was not completed when the author visited. Steps in this process are as follows: rotary screening; dust storage; sorting with salvage; magnetic separation; rasping or hammermilling; automatic proportioning of refuse, dust and sludge; mixing; composting in six cells for one day each; windrow composting; maturing; and ballistic separation. Cinders, removed in preliminary screening, are not returned for composting. By pre-setting controls, the proper amounts of dust and sludge are added to the variable flow of refuse to give a mixture of desired moisture content; 65 percent has been found to be optimum. The materials then are mixed in a rotating drum mixer.

The mixture is transported by means of a traveling grab to the top of the six-story compost building. Cells are perforated semi-circular troughs capable of being emptied downwards by rotation. The perforations and the chimney effect, caused by temperatures of about 165° F. (in the second or third cells), keep the compost aerobic. Further decomposition is provided in windrows under shelter, stacked on hollow concrete blocks, for a 6-week period with no turning. For additional curing and storage, the compost is finally windrowed outdoors on an impervious surface. The large plant recently completed in Bangkok, Thailand, is patterned after the Jersey system.

Continuous Mechanical Composting With Positive Aeration

This general process involves continuous mixing with gradual particle size reduction and positive aeration. The Earp-Thomas type of plant might qualify under this heading. The plants of this type in Paris, at Michigan State (U. S.), and at Kobe, Japan, have all ceased operation. (The Michigan State and Kobe installations involved modifications in design and operation from the

(*Continued on page* 158)



● THIS modified activated sludge secondary treatment plant, which was the second plant accepted by Madison Township Sewerage Authority, is designed to serve a new 500-home area.

PACKAGE PLANTS PROVIDE SEWERAGE *FOR A FAST GROWING COMMUNITY*

LAWRENCE HIRSCH
Charles J. Kupper,
Consulting Engineers,
New Market, New Jersey

A SEWERAGE authority committee, working cooperatively with subdivision developers, the Township Committee and Planning Board and the County sewerage authority, has installed sanitary sewerage facilities in Madison Township, New Jersey, with a present value of $2,780,610. Planning has extended over five years; actual construction for three years.

A flexible master sewerage plan developed by the Authority embodies prefabricated package-type lift stations and primary and secondary sewage treatment plants for expendable installations. These are to be supplemented by a permanent system of six major trunk sewers, one major pumping station and one permanent sewage treatment plant as the Township develops.

The first package treatment plant, a modified activated-sludge secondary type, was eliminated within three years by by-passing to the newly constructed South River interceptor of the Middlesex County Sewerage Authority (MCSA) via the outfall leg of the Madison Authority's first trunk sewer completed in 1959.

A second package type secondary treatment plant designed for 450 home units with expansion potential, was acquired from the Central Park subdivision developer. Ultimately this plant will be converted to a permanent pumping station for conveying sewage to the Laurence Harbor - Cliffwood Beach drainage area of the Township.

A third sewage treatment plant, primary type, was acquired in June, 1960, together with the collecting sewer system for Knollcroft, a newly developed 200-home subdivision in the Cliffwood Beach area of the Township.

Three underground package type pumping stations have been accepted from the developers and are owned and operated by the Authority. All are equipped with separately housed, auxiliary gasoline powered generators, a requirement of the Madison Sewerage Authority and of the State Department of Health.

Two of the generators, centrally located in Sayre Woods South, currently a 1700-home development, are enclosed in low cost garage type structures blending with the development architecture. Pumping facilities will soon be replaced by extensions to the newly constructed Deep run gravity trunk sewer. One extension is on the engineer's drafting table and will eliminate one pumping station.

The third pumping facility is operable and complete, less finished grading, fencing and access road. It is temporarily maintained by the subdivision developer to serve the first several occupants of a 200-home subdivision.

Some 2,000 homes are currently connected to the sewer system through 141,628 feet of 8 to 12-in. collecting gravity sewers (asbestos cement and vitrified clay pipe). In addition are 16,544 linear feet comprising the 24 to 36-in. Deep Run trunk sewer.

The first major trunk sewer was completed in the fall of 1958, connecting the 1700-home Sayre Woods South subdivision collecting sewer system to the South River interceptor of the MCSA.

The growth of the Township and installed sewerage facilities has been rapid. The population of 7,366 in 1950, had no sewers; in 1958, with a population of 16,000, there were 400 sewer connections. In 1959, the increase was to 20,000 population an 1,237 connections; in 1960, the 22,691 people were served by 2,002 sewer connections (for the first six months.)

The success, or failure, of a sewerage authority project is dependent on the practicability of constructing, operating and paying for the project. Working with the Consulting Engineer's feasibility report, the investment banker or financial advisor applies the final and most important test: Is the rate structure and revenue forecast sufficiently sound to warrant financing of the project?

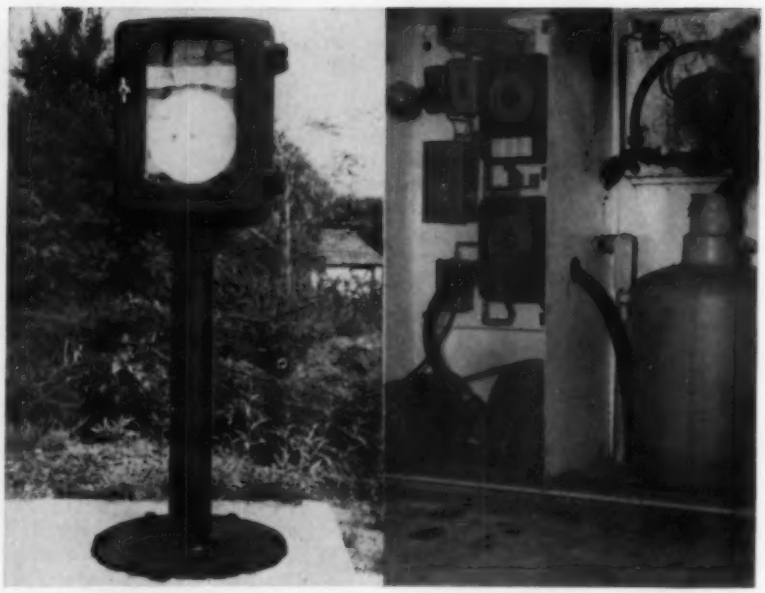
Madison Township was quick to see the need for long-range planning in the early 50's as it became clear that builders and realtors were interested in the Township's favorable development potential. With many new problems to be faced, early action created the Madison Township Sewerage Authority, a public corporation under New Jersey law.

The Authority's engineering, legal and financial advisors translated ideas into working policy, rules and regulations governing the submission, review and approval of major subdivision sewerage plans. The design features of each subdivision plan is handled by professional engineers, permitting unrestricted planning by each developer to suit his particular timetable with minimum engineering costs chargeable to the Sewerage Authority. A master sewerage plan developed by Authority engineers provides a flexible but definitive blue print of overall requirements.

An agreement was consummated between the Middlesex County Sewerage Authority (MCSA) and the Township Authority to convey Township sewage from the South River drainage area (comprising 80 percent of the Township's 40.2 square miles) through the County's South River interceptor sewer for treatment and disposal by the County. The contract is similar to those accepted by other municipalities in the Lower Raritan Valley.

The MTSA master plan is a working guide to potential developers and their engineers. From this, the engineers can prepare preliminary cost estimates and plans for their local sewage collecting systems. Upon approval of final plans, the on-site and off-site sewerage required for a development is installed by the builder's forces, and inspected by the Authority's Engineer. Inspection costs are borne by the builder through appropriate fees charged by the Authority.

The trunk sewers are designed to serve natural drainage areas according to zoning requirements but tempered by hydraulic and economic feasibility considerations. Typically, a developer's 24-inch design, off-site trunk sewer was increased to 36-inch for area-wide considerations. The Authority reimbursed the developer for the differential cost of constructing the larger sewer.



● **FLOW METER and sampling device measure volume of flow and physio-chemical characteristics of sewage delivered to the County Authority by the Madison Township Sewerage Authority. The measured factors determine cost of sewage treatment.**

● **THIS primary treatment plant for a subdivision is designed for 200 homes.**

Maintenance and Operation

Because the bulk of the sewer system has been acquired at minimum cost, the system requires a nominal amortization schedule in relation to its construction cost and far greater replacement value. The single largest expense in the $86,000, 1960 operating budget, covers service charges to the County Sewerage Authority for conveyance and treatment of sewage discharged to the County system. This was estimated at $50,000 for the 1960 Budget, anticipating an average number of homes occupied over the full year and based on unit charges established by the County rate

schedule. The County rate schedule is a basic program reflecting County sewage treatment operating costs. A Parshall flume and automatic sampling collector installed at the County-Township connection point measures four sewage characteristics: 1) Flow mgd; 2) biochemical oxygen demand; 3) chlorine demand; and 4) suspended solids.

Roughly 75 percent of the cost is based on flow charges, and the remainder on BOD, chlorine demand and suspended solids. A 22 percent increase has been effected in County costs since 1958, somewhat offsetting the lower rate of charge for larger flows.

Infiltration is combatted by rigid inspection of materials and workmenship during construction and by using standardized methods of tapping existing sewers; and continual surveillance is maintained for unauthorized taps or storm drain connections. Some $30,000 in the 1960 Budget covers the administrative expenses, bond amortization and operating costs for maintaining two pumping stations and two sewage treatment plants. Both plants are costly to operate, as anticipated, because they are relatively small in size and neither plant is presently operating at or near design capacity. Hence revenues are reduced, but fixed expenses for operation are not proportionately reduced.

Revenues and Rates

The New Jersey State Sewerage Authorities Law requires that equal classes of users, deriving equal benefits from the sewer system must pay the same service charge. The unit rate has been established at $60 per year for single family dwellings. This rate was developed from sewage treatment cost factors involving both County contract costs and MTSA treatment plant costs; operating costs of the sewer system; and administration and bond amortization costs. When necessary, the rate schedule has been amended to add new rate charges for different classes of users as they have been connected to the sewer system. Because all sewer service is supported by revenues derived wholly from sewer users, every participant must be charged commensurate with the sewer service to be derived. Hence the Board of Education, all religious organizations, etc., pay annual sewer service charges.

Sewer Revenue Bonds

No sewage project (or major subdivision) is considered feasible by the MTSA unless it provides fully for the present and for a reasonable future design period and is financially self-supporting.

The respective goals of builders and the Authority have been resolved in part through a long-term financing program. In effect, lenders of funds have been willing to invest in the Township, through the Authority, whereby the burden of costs for a well-planned sewage system will be shared by future residents and builders participating in the sewerage program.

The Madison Authority Bond Issue of 1959 provided $360,000 in bonds, maturing up to thirty years. The issue was attractive to investors because of its exemption from federal income taxes. The lender is protected by a trust agreement relating to the issuance of the bonds and the operation of the Authority.

The trust agreement provides that a coverage of 25 percent in excess of all operating costs must be provided by the supporting revenues. Surplus funds are required to be transferred to a renewal and replacement fund after meeting the requirements of a reserve account. The Consulting Engineer is specifically charged with the responsibility of reviewing Authority operations and certifying compliance with the trust agreement obligations. He assists in the preparation of the operating budget and approves the entire budget.

The engineer reviews the revenue rate schedule annually, certifying that revenues are sufficient for all operational expenses, the required amortization schedule, reserve funds and for certified renewal and replacement expenditures.

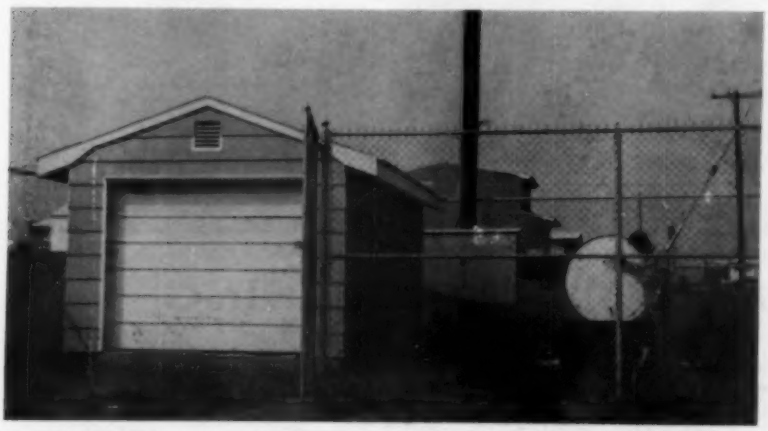
Future Projects

Preliminary engineering design has commenced on major sewerage projects in older sections of the Township. Two projects currently in the preliminary engineering design stage have been estimated to cost $2,350,000 and will provide sewerage to 2800 homes, schools and commercial establishments. These will include a trunk sewer and collecting system for the Old Bridge area to be connected to the MCSA system; and a treatment plant, trunk sewer and collecting system to serve the Laurence Harbor-Cliffwood Beach area of the Township, located on Raritan Bay.

The projects are of the self-liquidating type, financed by revenue bonds, and supported by current sewer rental charges. At the completion of these projects, all but one major developed area in the Township will be sewered.

Engineering design costs are being financed by a federal loan under the provisions of Public Law 560, to be repaid at the start of actual construction of the projects. The projects also qualify, in part, for federal grants under Public Law 660 (water pollution act) and it is planned to request a construction grant for the proposed treatment plant and major trunk sewers.

The Raritan Bay project will permit combining the operation of a small treatment plant with that of the much larger facilities of the proposed plant, permitting unit cost savings. The Old Bridge Project will provide a greatly increased sewage flow to the Middlesex County System and again all participants will benefit from the reduced unit costs for conveyance and treatment of the sewage at the County plant.



● **TEMPORARY pumping station at a new subdivision. Maintenance man looks into hatch of the packaged pumping station. Structure houses gasoline driven generator.**

The City of New Albany, Indiana, recently placed in operation a single plant which combines both mixed refuse and sewage sludge disposal functions. The installation of the C-E Incinerator Stoker and the C-E Raymond Flash Drying System at this same site enables New Albany to benefit from the economies inherent in a dual purpose plant.

Two C-E Incinerator Stokers with a daily capacity of 80 tons each, reduce refuse to a sterile ash that is free from clinkers and suitable for use as a sanitary land fill. "No-cost" Btu's from the burning refuse are used by the C-E Raymond Flash Drying System for drying the sludge. The utilization of this heat eliminates all auxiliary fuel requirements.

Primary sludge filter cake is reduced to approximately 8 per cent moisture content in the C-E Raymond Flash Drying System. The dried product can be sold for use as a soil conditioner to help defray plant operating expenses, with any excess being burned in the refuse incinerator.

Each of these C-E systems has been service-proved in installations large and small, and the combination furnishes a dependable and economical solution to a community's sewage-refuse disposal problems. Your nearest C-E office has more information readily available to you or your consultants.

New Albany operates combined mixed refuse and sewage sludge disposal facilities at same plant site

The Municipal Sewage Treatment and Incinerator Plant at the City of New Albany, Indiana, contains the C-E Raymond Flash Drying System and two C-E Incinerator Stokers.

Consulting Engineers:
Consoer, Townsend & Associates, Chicago.

Contractors:
Fruin-Colnon Contracting Company and C&C Construction Company (a joint venture), Fort Wayne, Indiana.

COMBUSTION ENGINEERING

C-293

Raymond Division: 427 West Randolph Street, Chicago, Ill.
Eastern Office: 200 Madison Avenue, New York 16, N.Y.
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NEWS BULLETINS

AMERICAN PUBLIC WORKS ASSOCIATION, 1313 EAST 60th STREET, CHICAGO 37, ILLINOIS

APWA Receives $2,700 Grant For Transportation Seminars

The Automotive Safety Foundation has approved a grant to the American Public Works Association in the amount of $2,700 to be used to help finance a series of seminars to acquaint public works officials with the need for urban transportation planning and with modern planning techniques. These funds are to be matched by the Association.

Plans and arrangements for the seminars will come under the direction of APWA's Transportation Committee headed by John A. Bailey, executive director, Urban Transportation Study Board, Philadelphia, Pa. The Board of Directors of the Association established a Committee on Transportation in 1960 for the express purpose of acquainting public works officials with the program developed by the National Committee on Urban Transportation and more specifically, to give them a working knowledge of the techniques, standards and procedures described in the manuals.

The seminars will be held in various cities across the country to permit easy access for attendance. The first will be held in Richmond, Va., on March 29, 30, and April 1. Further information concerning this seminar and the scheduling of others will be available in the near future.

The long range goals of the seminars will be to focus the attention of public works officials on the importance of urban transportation planning and acquaint public works officials with the latest techniques, procedures and developments in this important field of activity.

Make Your 1961 Nichols Award Nomination Now

Nominations for the Charles Walter Nichols Award are now being received by the Award Committee headed by Samuel Baxter, Water Commissioner, Philadelphia, Pa. All nominations must be in by June 15, 1961.

This award is presented annually to a deserving member of the American Public Works Association in recognition of an outstanding and meritorious achievement in the broad field of sanitation, including refuse collection and disposal, street sanitation, sewers and sewage treatment, and water supply and treatment. It consists of an honorarium of $500 and a scroll describing the achievement.

There are many Association members deserving of consideration for this award. It is up to you as a member of the APWA to make certain that these individuals are recognized. To be eligible, the candidate need not to have made a revolutionary invention, but simply to have done something which reveals originality of thought and aggressiveness of execution in the operation or administration of a function or the design of a facility in his particular community.

All that is needed to nominate a candidate is one short paragraph naming the individual and stating what he has done. Mail the nomination to the Charles Walter Nichols Award Committee in care of the American Public Works Association, 1313 East 60th Street, Chicago 37, Illinois. Any further information that is needed will be obtained by the committee.

The Award will be presented at the annual Public Works Congress and Equipment Show, Sept. 24-27 in Minneapolis, Minn. The candidate must be an active member of the Association, engaged in full-time employment with a municipal government. The recipient shall be selected by the awards committee and confirmed by the Association's Board of Directors.

Mid-West Chapters Plan Public Works Conferences

The newly formed Illinois Chapter and the Missouri Chapter are putting their heads together in preparation of a Mid-American Public Works Conference to be held in St. Louis, April 24th and 25th.

A highly informative technical program is being planned to include top officials speaking on many of the current problems in the public works field. Also on the agenda will be a social program to help those in attendance get acquainted with others in the field, to allow for relaxation and enjoyment, and an informal sharing of ideas.

OFFICERS: Frederick W. Crane, Buffalo, N. Y., *President;* Albert G. Wyler, New Orleans, La., *Vice President.* REGIONAL DIRECTORS: (term ending 1961) Louis H. Moehr, Wyandotte, Mich.; John A. Morin, Oakland, Calif.; Roy W. Morse, Seattle, Wash.; (term ending 1962) Paul R. Screvane, New York, N. Y.; Manon P. Phillips, Augusta, Ga.; Edward J. Booth, Bismarck, N. D.; (term ending 1963) George J. Maher, Lewiston, Maine; Robert S. Hopson, Richmond, Va.; Harlan H. Hester, Fort Worth, Texas. *Immediate Past President,* Jean L. Vincenz, San Diego, California. Robert D. Bugher, *Executive Director.*

Think twice before you speak to a friend in need.

—Ambrose Bierce

A GOOD FRIEND and neighbor was chilled to the bone, stuck in the snow, and twenty minutes late for work.

He had a short temper, and a long shovel. It would have been foolhardy to say "Good morning." Or "What's the trouble?" Or "Need help?" You know what I mean. The morning was lousy . . . the trouble was plain . . . he did need help . . . I had it to offer . . . and the less said, the better.

I got out the box of salt-chloride mix that I keep in the trunk of my car, and waded through the drifts to his driveway. Silently, swiftly, I poured generous piles of the mix fore and aft of his rear wheels. By the time he'd caught his breath, the mix had done its work, and he took off.

So now his wife calls me the silent Samaritan. Of course, she saw the last act of this touching little pantomine. I got stuck that morning, too . . . and I *stayed* stuck, because the last of my mix had gone under my neighbor's wheels.

The moral of my story is not "Charity begins at home." It is "Be prepared." Have you checked your stock of salt-chloride mix lately?

Wyandotte Chemicals Corporation, Dept. FS, Wyandotte, Michigan. Offices in principal cities.

Wyandotte CHEMICALS

MICHIGAN ALKALI DIVISION

HEADQUARTERS FOR CALCIUM CHLORIDE

Registration fees for members and non-members will be $15.00; for ladies $5.00. The Executive Committee for the meeting will include: Herbert Poertner, public works director, St. Louis County, Mo. (Chairman); Fred Penning, director of public works, Wood River, Ill.; Thomas Griffin, director of public works, Alton, Ill.; Frank Kriz, president, board of public service, St. Louis, Mo.; Herman Weise, director of public works, Collinsville, Ill., and Alfie M. Johnson, department of the president, board of public service, St. Louis, Mo.

A second conference, the Tri-State Public Works Conference, being put on by the Ohio, Indiana, and Kentucky Chapters will be held at the Gibson Hotel, Cincinnati, Ohio, April 27th and 28th. W. C. Wichman, director, department of public works, Cincinnati, is general chairman for the meeting.

Many Topics on Program of Northern California Meeting

Warren Mendel, state manager, Engineering and Grading Contractors Association, speaking at the eighth annual meeting of the Northern California Chapter at Oakland, discussed the relations between Public Works and the E.G.C.A. at the noon luncheon. There were 122 in attendance.

The County Officials' Place In The APWA

There is no doubt among the county officials with whom I have discussed the matter that we have much both to give and to gain from our closer association with our counterparts in municipalities. This is particularly true in metropolitan areas where urban growth around the fringes of incorporated communities generates a continuing need for coordinated efforts at both the planning and operational levels.

The American Public Works Association is the one outstanding organization that best provides this meeting ground of common interests. It not only brings together public officials at each staff level in his particular specialty on a national basis, but through its Regional and Chapter organizations affords opportunity for mutually beneficial and constructive discussions and exchanges of views concerning problems and the solutions which have been developed.

One very practical example of how the APWA has helped more specifically in this regard is in its sponsorship of the training program in Municipal Public Works Administration. Here in the Metropolitan Washington area surrounding our Nation's capital, the course put on by the University of Virginia was attended by twenty-three officials from practically every surrounding jurisdiction, including cities, towns and counties in nearby Maryland and Virginia. The course, besides its educational and training features, became a monitored discussion of common problems and exchanges of ideas on each subject. It also brought all of these Public Works officials together weekly on an equal plane and afforded them an opportunity to really get to know each other.

Rural living standards and the never-increasing demands for amenities available to urbanites in the form of improved roads, drainage, utilities and services, as well as the constant necessity for advance planning as our population grows, make it increasingly important that county officials keep informed and prepared to meet the demands as they develop.

Increasing county membership and active participation in the APWA will generate more consideration of county problems. From this, logical solutions will evolve.

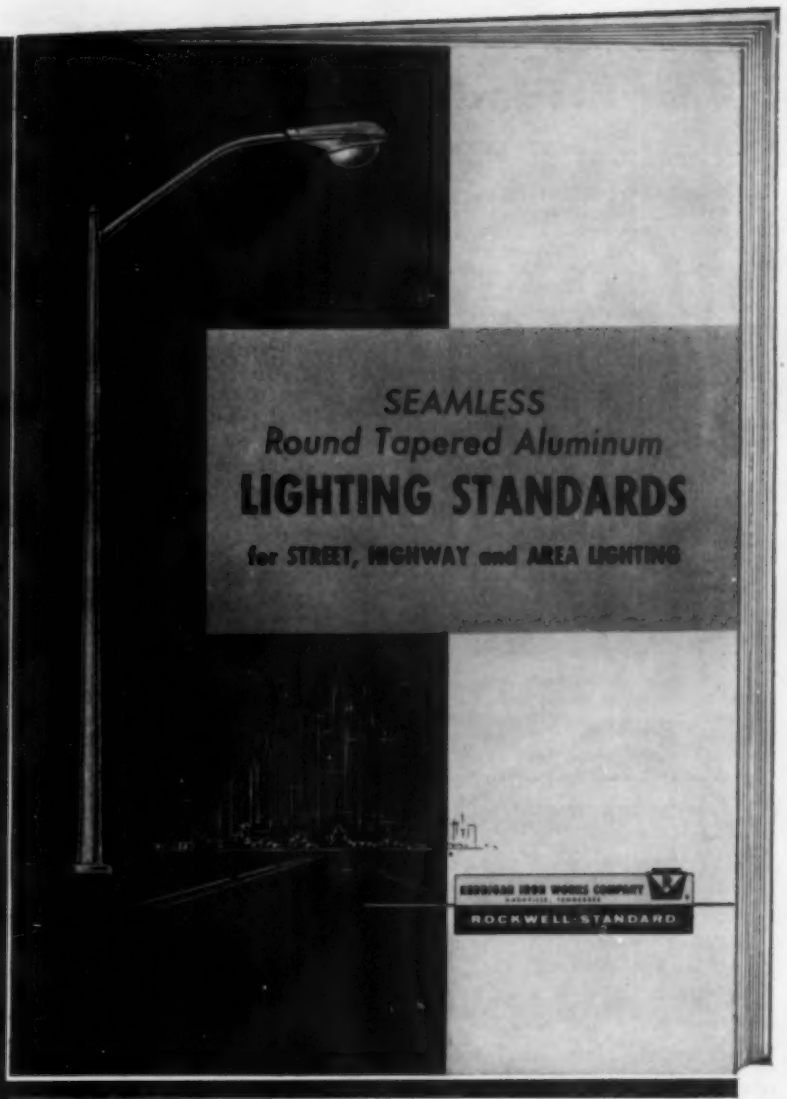
The APWA offers this opportunity to the mutual benefit of all.

Carl W. Porter

Carl W. Porter is the Director of Public Works of Fairfax County, Virginia. A Registered Professional Engineer, he retired from military duty in 1958 after over 30 years of active commissioned service in the Corps of Civil Engineers of the Navy.

NEW Catalog

LATEST DESIGNS in STREET LIGHTING STANDARDS



New, streamlined, functional lighting and traffic signal structures combine beauty and grace with strength and installation ease to complement the most modern street, highway or area landscaping. These attractive outdoor lighting products are displayed and described with full engineering data in Kerrigan's new, round tapered aluminum lighting standards catalog. Get YOUR copy now.

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A SUBSIDIARY OF
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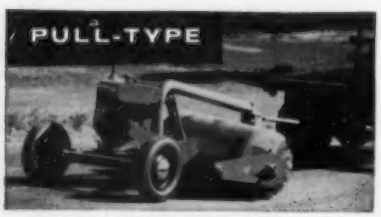
STREET AND AREA LIGHTING STANDARDS IN STEEL AND ALUMINUM

M-B SWEEPERS... Year 'Round Fast Cleanup!

Here's the fast answer to road and highway sweeping in any season. Rugged M-B Sweepers clear roads, walks, parks, even lawns of dirt, debris, leaves, snow. Best, too, for chip spreading, seal coating, black topping. There's a type and size to make your jobs easier. Ask your tractor dealer or write M-B Corporation, New Holstein, Wis.

Two-way, angling sweepers with powerful hydraulic drive, swing and lift, speed up sweeping jobs. Exclusive centered sweeping path. Low cost, fixed angle sweepers with mechanical drive also available. 5 ft. and 6 ft. brush lengths.

Quick, on-the-job mounting, two-way type . . . interchangeable with bucket of any tractor loader. Independent hydraulic system with pump remains completely assembled on or off tractor.



For the big jobs, 7 ft. or 8 ft. two-way, pull type sweepers. Engine swings with brush providing simplified, rugged drive. Traction drive type available . . . also sprinkler or blower.

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SWEEPERS
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Mendel stressed the importance of the construction industry on the economy of the State, citing it as the second greatest dollar industry in California. He stated that the construction industries' impact on the public should be softened by increased emphasis on public relations to explain the why's and wherefores of costs and the necessity for inconvenience due to construction activities. According to Mendel, the E.G.C.A. banded contractors together to raise standards, and public works people are requested to judge the association by its goals and accomplishments, not the few unprincipled members it is attempting to educate. To avoid unsatisfactory contractor-agency relations, it is recommended that a preferred bidders list be established to qualify contractors.

During the afternoon, King F. Cole, community development director, City of San Leandro, spoke on "A New Approach to Urban Renewal." Cole established himself in an ivory tower—but installed a PBX system to sound out the public and gauge politics prior to presenting plans for community development. A provision was made to review master plans annually. Cole had trouble getting standard plans and federal projects for renewal approved by the City Council and the public and so he started a "Community Development Office" which sells ideas and the need for development in addition to the normal planning function.

Carl Messinger, aerodynamicist, Hiller Aircraft Corp., Palo Alto, spoke on "A Realistic Look at Helicopters." Messinger stressed that heliport facilities are needed before the helicopter can be utilized to serve the public efficiently. The principal use of 'copters is to transport people, but widespread use is made in wire stringing, snow sampling, fire fighting, agricultural seeding and spraying, public service, surveying and mapping, and construction transport. Contrary to popular belief the approach and take-off patterns at heliports are important and an 8:1 slope in the clear path for arriving and departing 'copters is necessary. For larger craft the heliport pad should be 400 feet by 200 feet.

Trends in Education

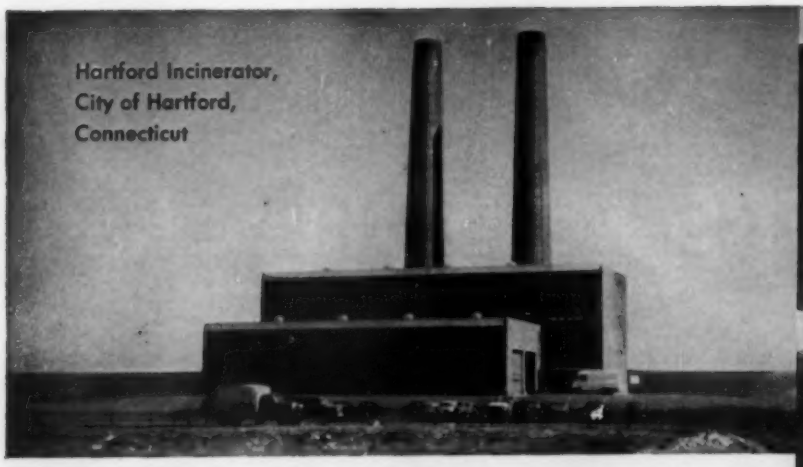
Speaking on "Trends in Engineering Education," Clark H. Oglesby, Professor of Civil Engineering, Stanford University, informed the group that since World War II the overall enrollment of Civil Engineering students has fallen from 12 to 15 percent and now is smaller than mechanical or electrical engineering students. The present curriculum is based on: (1) Basic science and mathematics, (2) professional courses, structural design, etc., (3) internship on the job (2 years for registration). Colleges now want to concentrate on (1) and leave (2) and (3) to employees for on-the-job training.

Graduate work, due to the growth in technical fields, is a requirement for the better paying position. There are 3 to 4 graduate students to each senior at Stanford now. A problem arises in that teachers have research contracts (which support graduate student work) and the aim of the Ford Foundation grants to the school is to turn out PhD candidates. This requires research experience but allows time for outside experience. Many teachers know little and care less about professional engineering. This means that less attention is given to undergraduates because teachers are wrapped up in research, graduate students, and economic planning.

James L. McAdoo, Bay District Lighting Engineer, Pacific Gas and Electric Company, spoke on "Street Lighting Goals." McAdoo named street lighting as the perfect tool in helping to prevent crime and aiding the growth of the community.

Assessment Proceedings

Eugene K. Sturgis, Attorney at Law, spoke on "Assessment Proceedings." He defended his profession with the statement that the great diversification of laws on assessment proceedings was caused by the different approach to the problem taken by the originators of the laws. In California the 1911 Improvement Act type of assessment proceedings is the most popular and gives the contractor a first mortgage on all property in the district until the assessments are paid off. The cost of the work is not fixed, however, until the work is completed. Others prefer the 1913 Improvement Act method of assessment proceedings which requires public hearings, based on complete plans and specifications and definite bids by contractors. The cash is raised and a fixed price for the work has been established before work is started by the contractor under the 1913 Act method. Either type of act is valid and both have merit. Proceedings are constantly being changed to reflect the needs of the originators of the laws—not to make work for attorneys.



Hartford Incinerator,
City of Hartford,
Connecticut

(1) Hartford's Fitchburg Chipper

(2) Fitchburg Chipper in action

Modern Hartford disposal plant uses FITCHBURG CHIPPER

Hartford's new municipal incinerator is used to dispose of more than 400,000 pounds of waste every day. The large picture above shows this efficient, attractive plant—one of the most modern in the nation.

An important part of Hartford's up-to-date disposal program is their portable Fitchburg Chipper, which cleans up disposal jobs the incinerator cannot handle, and goes out on location for road use.

Hartford had these problems:

• *Banana Stalk Disposal* • *Brush Disposal on New Roads*
• *Christmas Tree Disposal* • *Road Clearance from Storm Damage*

How a Fitchburg Chipper solves these problems:

Joseph J. Coffey, Superintendent of the Hartford Incinerator, tells you in his own words how Hartford solves these problems: BANANA STALKS: "We chip 2 to 4 tons of banana stalks each week. These stalks will not burn regardless of heat in the furnaces, and we had to dump them until the Fitchburg Chipper went on duty." CHRISTMAS TREES: "During the post-Christmas season we receive many Christmas trees which we can now get rid of without the trouble of watching for burnt-down spike-like stubs which cause much trouble with the incinerator equipment."

BRUSH DISPOSAL: "Our Highway Division has used our Fitchburg Chipper to clean up the brush and branches along newly developed road areas. By chipping brush, the city saves in use of both manpower and trucking costs." ROAD CLEARANCE: "If we get hit again by hurricanes or bad wind storms, we now have an excellent piece of equipment that will enable us to readily open up the streets for emergency traffic by reducing the fallen branches to chips."

As to maintenance, Mr. Coffey says: "Our Fitchburg Chipper will pay for itself in a very short time. Maintenance, so far, is just keeping it supplied with gasoline and fully lubricated. It is easy to handle, easy to store, and very easy to use."

Get the facts! **Mail coupon for big, FREE, colorful booklet.** Specifications, operating data, explanation of exclusive Fitchburg Safety Spring, actual letters from users.

FITCHBURG ENGINEERING CORPORATION

Read what leading Fitchburg users say

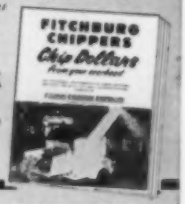
LINE CLEARANCE

The Shade Tree Service Company, Webster Groves, Mo.: "Our figures show that production has been increased by a good 25% with the use of the Fitchburg Chipper. One man can operate the chipper with ease. He alone can handle as much, and more, brush in the same length of time as could two men loading brush on a platform body."

POWER COMPANY

Rockland Light and Power Company, Nyack, N. Y.: "Our men have been particularly pleased with their Fitchburg Chippers. They are rugged and reliable and the convenience of flexible, yet instant brush disposal has the advantage of promoting good public relations and still gives us efficiency."

NEW FREE BOOK
"Chip Dollars From Your Overhead"



Fitchburg Engineering Corporation
Fitchburg, Mass., Dept. PW-12

Send my Free Chipper Booklet.

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(Position or Company)

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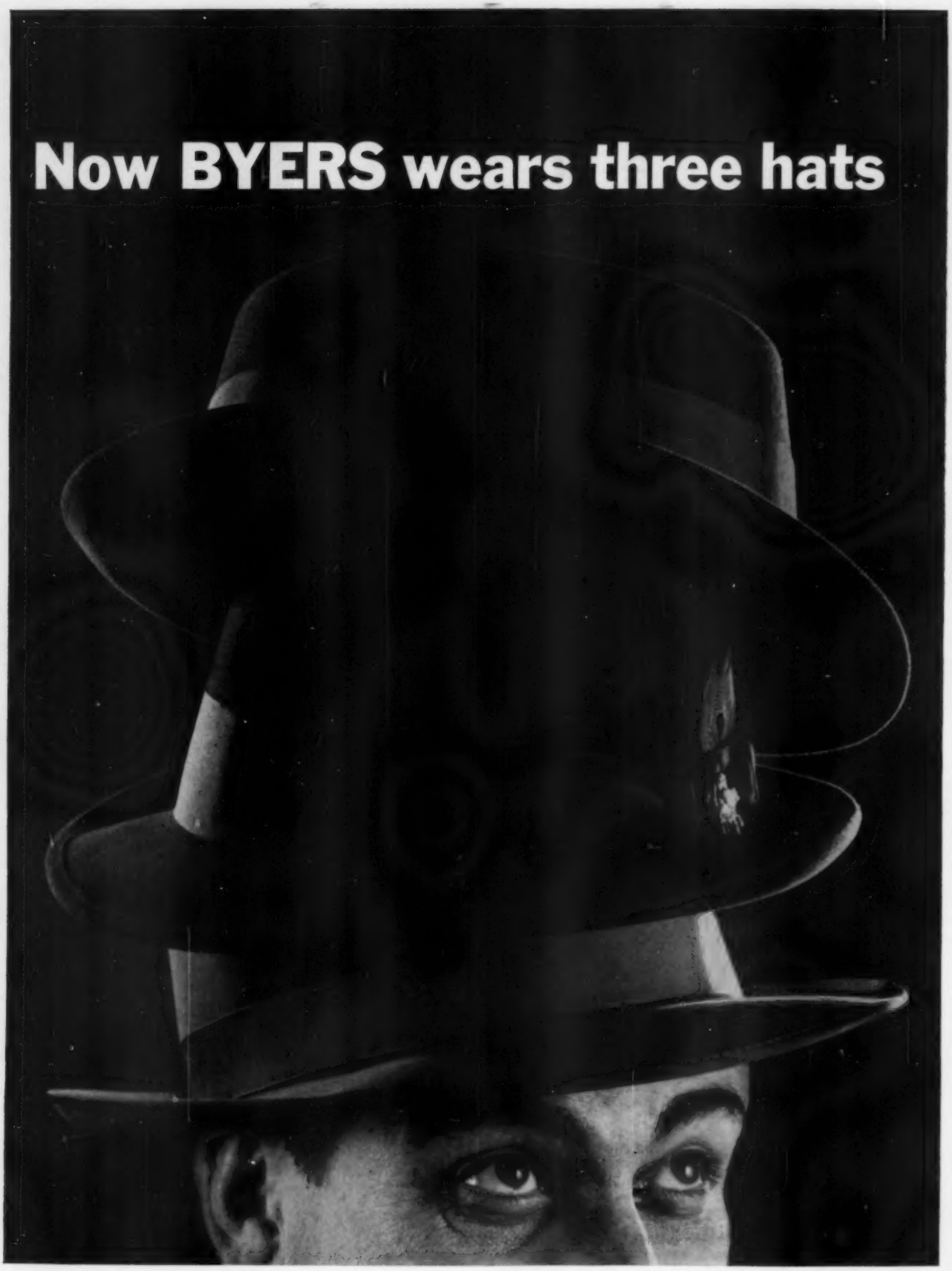
City_____ State_____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THE
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AND
REFUSE
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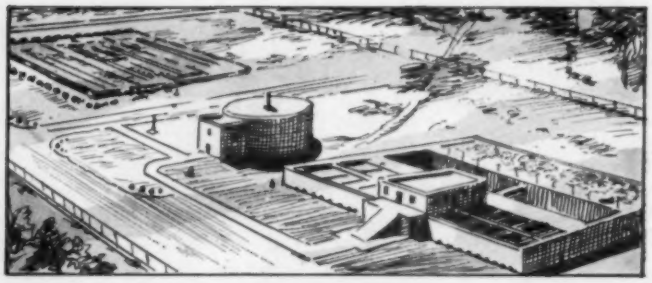

Prepared by **ALVIN R. JACOBSON, Ph.D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Automatic Sewage Sampler

The Birmingham, England, Public Works Department has designed an automatic sampler for collecting sewage on a continuous basis to meet the following conditions: 1) The sampler had to pass a manhole opening only 15¼ by 20 ins.,; be set up on a temporary platform in a manhole; and left unattended for 12 hours. 2) To detect short-lived flushes of strong wastes, the apparatus had to take a continuous sample. 3) All parts in contact with the sewage (which is industrial) had to be acid resisting to avoid damage and contamination of the sample. The apparatus evolved to meet these conditions consists of two layers of one-pint polythene sample jars, each layer consisting of two concentric rings, mounted in a framework which comes apart, complete with jars, into three separate segments. In the center of this array is a sealed can which contains a 12-volt motor and a clockwork time switch. The motor drives a vertical spindle projecting through the middle of the lid. The pumping action is obtained by rollers pressing in turn on a latex rubber tube. The pump discharges continuously into the cup on top of the spindle. Every 15 minutes the clockwork timing device switches on the motor driving the spindle which is then turned through 1/48th of a revolution and switched off. This moves the spout taking the discharge from the cup from one funnel on to the next, thereby filling the sample jar in the succeeding 15-minute period. When the spindle has completed one revolution, all 48 jars are filled, the pump motor is automatically switched off and the apparatus stops. A 12-volt battery supplies the power. The apparatus has operated with complete success.

"Automatic Sewage Sampler." By Sir Herbert J. Manzoni, C.B.E., City Engineer and Surveyor, Birmingham, England. *The Surveyor and Municipal and County Engineer*, 3 December, 1960.

Sewer System Has 17 Lift Stations

The City of Shively, a suburb of Louisville, is Kentucky's fastest growing community. With an increase of nearly 530 percent to a population of 13,000 in the last 10 years the City suffered growing pains, part of which were caused by the lack of sanitary sewers. After a thorough study of various proposals, it was decided that Shively should construct its own sewerage system and sewage treatment plant. With nearly 60 miles of 8-in. to 18-in. sewers required to serve this large relatively flat area, it was necessary to construct 17 lift stations in order to overcome the necessity of excavating sewer trenches in excess of 18 to 20 feet. The design took advantage of the economies and ease of installation of factory-built sewage lift stations. The eight factory-built pumping stations, ranging in capacity from 120 to 480 gpm, averaged about $18,675 each. The six pneumatic ejector lift stations, specified for the low ca-

PRIZE PACKAGES WILL FILL SWEEPER BROOM

● **FOUR BOXES of "Tynex" nylon filament, enough to fill a street sweeper broom, were a prize won by assistant city engineer James L. Brock, (left) of Summit, N. J., at the 1960 APWA Congress. The Du Pont material may be expected to outlast 15 to 30 natural fiber brooms under comparable street sweeping conditions, according to comparisons made by many city street departments. Fred Stewart (right) Du Pont sales representative, also presented Mr. Brock with a spin-fishing rod and reel.**

Atlanta's Planned Future

WITH P.F.T.

Atlantans have their eyes on the future. They are not content with their tremendous industrial growth which has averaged 83 new industries per year for the past 12 years and being the first city in the deep South reaching one million population. They are looking forward to an expanding growth. Atlanta is expanding and modernizing their sewage treatment plants to meet future needs.

The South River plant, one of Atlanta's largest, was built in 1936. Sewage treatment equipment by P.F.T. was selected for this plant and has been an integral planned part of every expansion.

WIEDEMAN AND SINGLETON, CONSULTING ENGINEERS of Atlanta designed each of the three additions to the South River plant. P.F.T. equipment at this plant is as follows—

1936—2 P.F.T. 55′ Floating Covers, 4 P.F.T. 173′ Rotary Distributors. **1953**—Added 1 P.F.T. 55′ Floating Cover, 2 P.F.T. #500 Heater and Heat Exchanger Units with P.F.T. Gas Safety Equipment. **1959**—Added 2 new P.F.T. high capacity Rotary Distributors on 150′ Filter Beds. **1960**—Added 2 P.F.T. 100′ Floating Covers, 2 P.F.T.—Pearth Gas Recirculation Systems, 2 P.F.T. #1000 Heaters and Heat Exchanger Units, Supernatant Selectors, Gauge Boards and Gas Safety Equipment.

This is the first of Atlanta's four sewage treatment plants to be enlarged in the comprehensive plans to prepare for the future. You'll be hearing more about P.F.T. in Atlanta's far-sighted program.

P.F.T. Floating Covers and Rotary Distributors at Atlanta plant.

P.F.T. *waste treatment equipment exclusively since 1893*

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pacity points in the system, range in capacity from 30 to 100 gpm at an average cost of $9,650. Three job-built pumping stations, constructed of reinforced concrete and masonry, will serve as collection points in the system, thereby dividing it into three sub-systems of factory-built stations. The three job-built pumping stations cost approximately $35,000, $37,000, and $45,000. The sewage treatment plant includes the following major units: Metering assembly; shredder and grit chamber; two 35-ft diameter clarifiers; two sludge digesters and combined control and head house; sludge drying beds; and effluent pumping station which discharges the plant effluent to the Ohio River, 2½ miles away. The project was financed by the issuance of $3,855,000 in revenue bonds and by a $150,000 Federal grant.

"Sewer System Has 17 Lift Stations." By Claude Lessig, Design Engineer, and F. Lee Ross, Project Engineer, J. Stephen Watkins, Consulting Engineers, Lexington, Ky. PUBLIC WORKS, January, 1961.

ABS and Digestion

To determine the effects of syndets on anaerobic sewage sludge digestion, a laboratory study was undertaken with the addition of an anionic synthetic detergent to a laboratory digestion unit. The experimental apparatus consisted of two typical laboratory units. Each unit consisted of a four-liter aspirator bottle to which 3 liters of digesting sewage sludge were added. Gas was collected in two sets of one-liter cylinders inverted in two-liter cylinders. Both digestion units were housed in a common incubator maintained at 35° C. Based on the laboratory studies carried out, the following may be concluded: 1) A gradual increase in the concentration of alkyl benzene sulfonate has no apparent effect on the digestion process until the concentration of the "added" ABS (ABS in excess of that present in the raw feed sludge) reaches a somewhat higher level, when a noticeable decrease in daily gas production may be expected. 2) Subsequent increase in the concentration of "added" ABS will result in larger decreases in daily gas production. 3) An increase in the concentration of "added" ABS will be reached which will result in a serious disruption of the digestion process, such that the anaerobic decomposition of organic solids and gas production will cease. 4) The important relationship appears to be the ratio of ABS to total solids, or possibly to particle surface area. No work was done to evaluate the surface area consideration, but the fact that digestion units are operating satisfactorily with 272 mg/L ABS indicates that concentration alone is not the dominant factor. An ABS concentration of 3.3 mg/g of total solids will result in a serious disrpution of the digestion process.

"The Effects of ABS on Anaerobic Sludge Digestion." By John W. Hernandez, Associate Engineer, Environmental Sanitation Services, New Mexico Department of Public Health, Santa Fe, New Mexico, and Don E. Bloodgood, Prof. of Sanitary Engineering, Purdue University, Lafayette, Ind. *Journal WPCF*, December, 1960.

Sludge Incineration

Incineration of sewage sludges does not necessarily insure complete elimination of nuisances. Fly ash and odor problems are rather common and are becoming more so as expanding populations encroach on sewage treatment plant sites. Frequently a solution to this problem may be in the construction of a tall stack; in other instances, geographical conditions or prevailing

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MonoRodeR: Continuous straight rod in lengths to 1,200 ft., Infinitely Variable Positive Drive Speed. Footage Counter and rotation Tachometer.

CoilRodeR: Coil rod cleaner for house laterals and sewers not over 6" diameter.

Instant Reverse Power Drive: For small jobs and limited budgets.

BUCKET MACHINES

Truck-Loder: Loads right into truck, ends dumping sewage on street, eliminates shoveling and cleanup. Sets up from street level using Surface-Hung Manhole Rollers. Safety Belt Booster Clutch, Footage Meter, Instant Dual Speed Transmission.

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winds bring about complications. A notable example was at Pittsburgh where public clamor, aroused by obnoxious odors, forced a shutdown of the incinerators after 5½ months of operation. Because primary sludge was being concentrated by the anaerobic flotation method and incinerated without the addition of chemicals, it was deemed necessary to determine whether sludges thickened by this method had unusual temperature requirements for odor destruction. Primary and digested sludges were obtained from several plants and studies on required temperatures for odor destruction were conducted in a Lindberg combustion furnace. The gases escaping from the furnace were collected in polyethylene bags for odor evaluation by a panel of 5 men. On the basis of this study it was concluded: 1) That the temperature required for odor destruction varies somewhat with the character of the sludge processed and the method of concentration or conditioning. 2) The vapors from only a few sludges were adequately deodorized at 1250° F. 3) Most sludges required a temperature of 1,300° F or 1,350° F and a few required 1,400° F. 4) The intensity of odors was appreciable at 50° F below the threshold level and severe at 100° F below. 5) Odor-free incinerator operation requires that strict attention be given to control of temperatures in the deodorizing zone and that a factor of safety be employed commensurate with atmospheric conditions and other local factors.

"Temperature Requirements for Odor Destruction in Sludge Incineration." By Clair N. Sawyer and Peter A. Kahn, Metcalf & Eddy, Boston, Mass. *Journal WPCF*, December, 1960.

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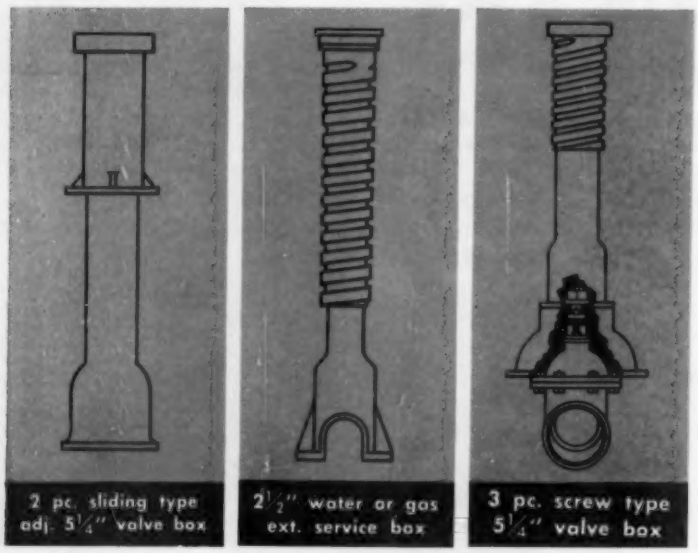

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ORP for Sewage Plant Control

Oxidation-reduction potential has assumed an effective place as a valuable tool in the survey, operation and control of sewage treatment processes at the Miami, Florida, sewage works. The use of electrical potential measurements (ORP) at this plant points the way to many other useful process applications. It is the belief of the author that there are probably many more possible uses for the potential measurements in sewage treatment than there are practical and productive places to apply it. Some of these application possibilities are: 1) Measurement of freshness of raw sewage entering a plant or in the pumping stations. 2) Keeping raw sewage fresh with air or chlorine. 3) Control of prechlorination for freshness, odor control, and reduction of loading on aeration tanks. 4) Control of aeration in aeration tanks in order to provide sufficient air and to avoid waste. 5) Effect of aeration condition of final sludge and progress of septicization. 6) Subresidual chlorination control of final and waste sludges within the plant as well as in the final effluent. 7) Measure of conditions of digestion. 8) Measure of conditions in streams, bottom sediments and muds. Oxidation-reduction potential is a valuable tool in sewage works operation, but it must be made more convenient and simpler to use and interpret if it is to play its rightful role in plant control.

"ORP for Sewage Plant Control—From Raw Sewage to Effluent." By Clarance R. Henry, Research Chemist, Dept. of Water & Sewers, City of Miami, Florida. *Wastes Engineering*, December, 1960.

Other Articles

"New **Compactor Replaces Two Open Trucks** and Halves Collection Costs." The Borough of Hellertown, Pa., cuts refuse collection costs in half. By Frank Force, Manager-Engineer, Hel-

Installing a Smith & Loveless "Oxigest" sewage treatment plant properly is as important as building it properly!

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lertown, Pa. PUBLIC WORKS, January, 1961.

"Density of **Enteroviruses** in Sewage." This report describes a quantitative method for the detection of enteroviruses in sewage. By Sally Kelly and Wallace W. Sanderson, Division of Laboratories and Research, New York State Department of Health, Albany, N Y. Journal WPCF, December, 1960.

"Constant **Temperature Control** Unit." This paper describes a control unit for converting an ordinary home-type refrigerator to a constant temperature unit on an intermittent basis, as needed for incubation, in the occasional examinations for BOD. By J. A. Castelli, E. P. Pendery and R. C. Palange, Robert A. Taft Sanitary Engineering Center, Public Health Service, Department of Health, Education and Welfare, Cincinnati, Ohio. Journal WPCF, December, 1960.

"**Robot Monitor** Keeps Watch on River Conditions." The Ohio River Valley Water Sanitation Commission has developed an electronic sentinel to improve its system of river surveillance for quality control. By Edward J. Cleary, Executive Director and Chief Engineer, and William L. Klein, Chemist-Biologist, Ohio River Valley Water Sanitation Commission, Cincinnati, Ohio. PUBLIC WORKS, January, 1961.

"**Toxicity** of Elemental Phosphorus." By means of parallel studies with colloidal and soluble white phosphorus, the colloidal form was found to be the toxicant for fish. By B. G. Isom, Tennessee Dept. of Health. Journal WPCF, Dec., 1960.

• • •

Storm Drain Design

(*Continued from page 89*)

with, a determination of the time of concentration which was estimated as closely as possible by discharging a fire hose at various rates of flow at the upstream corner of the block and timing the gutter flow to the point of en rance into the sewer. We finally settled on 12 minutes and the local "Intensity-Duration Curves" indicated that on the basis of a 1-year expectancy the critical intensity would be about 1.0 inch per hour, and for a 5-year expectancy about 1.6 inches per hour. It should be noted in this connection that because the methods used in establishing a time of concentration were not as accurate as a natural rainfall would provide, the resulting intensities were at best only an estimate. This was of no great consequence, however, for if we had known the exact figures we might still have had to wait 30 years to experience such a rain. The sole purpose was merely to have a good estimate of approximately what the most critical situation would be so that we might be able to judge properly the observations that we were to make, especially in the matter of noting whether there was any trend in evidence as the critical point was approached.

Analyzing Results

As a simple and direct way of analyzing the tabulated results we set up an ordinary graph sheet with the horizontal ordinates indicating rainfall intensities, "I", in inches per hour, and with the vertical ordinates representing rate of flow, or "Q", in cubic feet per second. In the formula Q = ARI, Q divided by I would, of course, equal AR, so on the graph we plotted two straight lines representing the two forms of AR under investigation; in one case the whole area x 45 percent, and in the other the street area only x 90 percent. On this chart all the actual "Q's" from storms of any consequence during the two years were plotted as points and in this manner we had a very simple method of determining their relationship to the two possibilities under consideration.

One glance at the finished graph tells the story without any reasonable doubt. In the vast majority of cases the observed Q's were extremely close to the line representing the street area x 90 percent, and the variations were so uniformly distributed on both sides of the line that one could only conclude that for the special circumstances involved, this particular formula was as close to the truth as would ever be possible.

As a result of these studies we came to the inevitable conclusion that in the flat part of the city of Puyallup, the simplest and most accurate procedure for designing a storm sewer system lay in using the street area only and a runoff factor of 90 percent. This means that as far as design purposes are concerned, none of the storm water that falls inside the property lines ever reaches the sewer system in time to affect the peak flow and we can therefore ignore it completely. We chose the property line because it is an easy point to identify, and we used 90 percent because common sense indicates that this would be fairly close to right. In this case the formula worked out far more accurately that one would have expected. Had it been otherwise, we would have changed our formula to fit the observed conditions.

The important aspect of the whole situation is simply this. There are two general procedures that can be used in designing storm sewers. One involves using "accepted procedures" that may have little relation to current problems. The other involves making the necessary observations and tests on the ground and incorporating the results into the necessary formula.

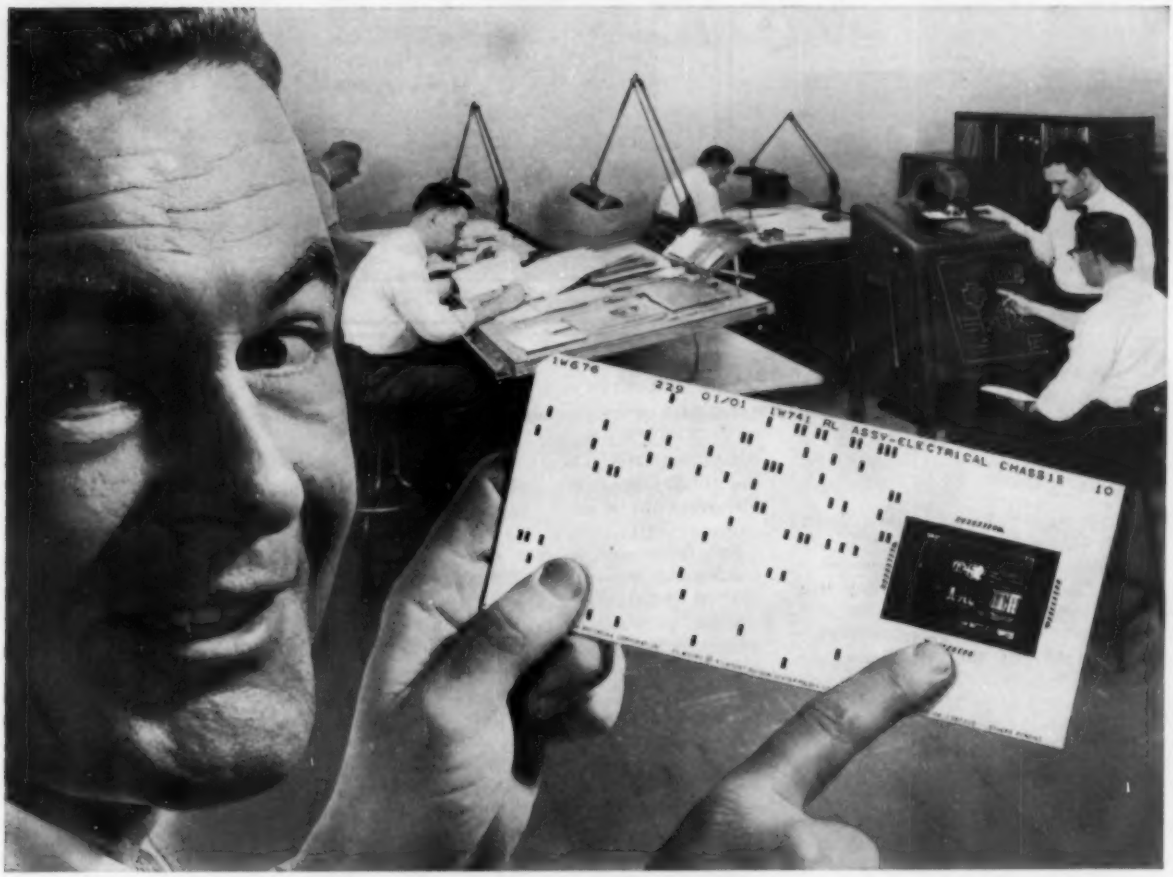
When Observations Are Needed

This is not to imply that observations of this sort are a necessary preliminary to every storm sewer that has to be constructed. If some one has already established an intelligent design criteria for any area, there is no use in duplicating the procedure if the conditions are comparable. There aren't too many of these conditions and they are not at all difficult to recognize. First and foremost is the general rainfall pattern for the area; second the type of soil; third, the slope; and fourth, the nature of the man-made features that cover the landscape. Well in advance of any major storm sewer design, rainfall-runoff studies should be conducted in every area and to the degree necessary to cover all of the existing variables.

Summing up, the design of storm sewers differs from anything else in the way of utility services, for here we are simply trying to outguess nature and are basing our conclusions on the balance of probability. The best engineering office in the country might easily design a sewer against a ten-year storm and experience a thirty-year downpour the day after the job was completed. The writer has always likened the designing of a storm sewer to the problem of taking out an insurance policy.

First, one has to decide on the relative value of that which is to be insured and in sewer work this is done by identifying the area as, say residential, where a little overload will merely produce a temporary inconvenience; or as commercial, where the flooding of basements could result in serious financial losses.

This done, the next step is to decide how much insurance one can afford, which, translated into sewer vernacular is equivalent to determining what expectancy or frequency will be designed against: A one-year, a five-year, a ten-year, or what? The shorter the frequency, the smaller the critical storm to be designed against, and the smaller the cost, but the greater the chance of having a storm that will overload the system. The longer the frequency, the heavier the storm, and the greater the cost, but the greater your chances of avoiding trouble.



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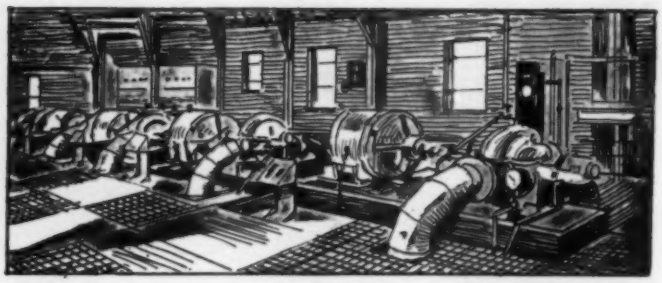
THE WATER WORKS DIGEST



Prepared by **ALVIN R. JACOBSON, Ph. D.**

Associate Professor and Head, Division of Sanitary Science, Columbia University School of Public Health

Radionuclide Tracers

Radionuclide tracers have been successfully used to study liquid flow, coagulation, settling and corrosion phenomena. Increasing use of these types of measurements will depend upon the exploration and development of these radionuclide tracing techniques. No single radionuclide has proved ideal for all purposes, the selection depending upon the following factors: 1) Half-life of the radionuclide; 2) suitability for measurement by laboratory or field equipment; 3) safety of personnel conducting the study and others who may be exposed; and 4) physical, chemical, and biological compatibility with the fluid being checked. Radionuclides tracing techniques may be used for the following measurements: Flow in pipes and tanks; tracing ground water flow; flow of solids in settling basins and in filter beds; measurements of water quality; chemical and bacterial assay methods; corrosion and scale formation studies; prediction of runoff; and many other potential uses.

"Radionuclide Tracers Solve Tough Measurement Problems." By D. A. Pecsok, H. P. Kramer and D. W. Moeller, Robert A. Taft Sanitary Engineering Center, United States Public Health Service. *Water Works Engineering,* December, 1960.

Dominion-Wide Program

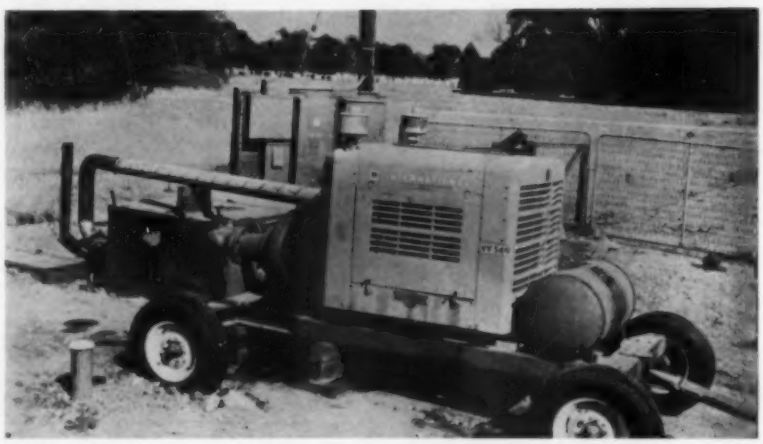
In order to bring about a more effective program of antipollution and water conservation, the author has proposed broad action by the Dominion government, with research and guidance as two of its main functions. This program would be under a leadership of a well-organized, effective Water Pollution Control Committee representing all interests in the field i.e., municipal, provincial and Dominion governments and industry. The Dominion government would provide the necessary climate for the four-way partnership so that the end-result would be a well-coordinated, effective program with the controls at the provincial level. The Dominion government would also become actively engaged in: 1) Public education; 2) financing; and 3) legal affairs in order to bring about an effective control program. The Dominion-wide program is necessary for the following obvious reasons: 1) Research should be done on a broad, cooperative program to avoid unnecessary duplication. 2) To encourage a cooperative effort at all levels of government and with industry. 3) Water is the Dominion's most important natural resource. 4) Significance of water pollution to national health. 5) Provide for economic stability. 6) Avoidance of non-competitive situations. 7) Quick amortization for industrial projects. 8) More uniformity in the water laws.

"A Dominion - Wide Program." Concerning the use, conservation and pollution of water resources. By A. L. Van Luven, H. E. McKeen & Co. Ltd., Lachine, Quebec. *Canadian Municipal Utilities,* November, 1960.

Salt-Velocity Flow Measurements

An extensive series of laboratory experiments, supplemented by field tests, has been made on the salt-velocity method of flow measurement. Comparative flow measurements were made by a standard

STANDBY ENGINE HELPS WATER DEPARTMENT



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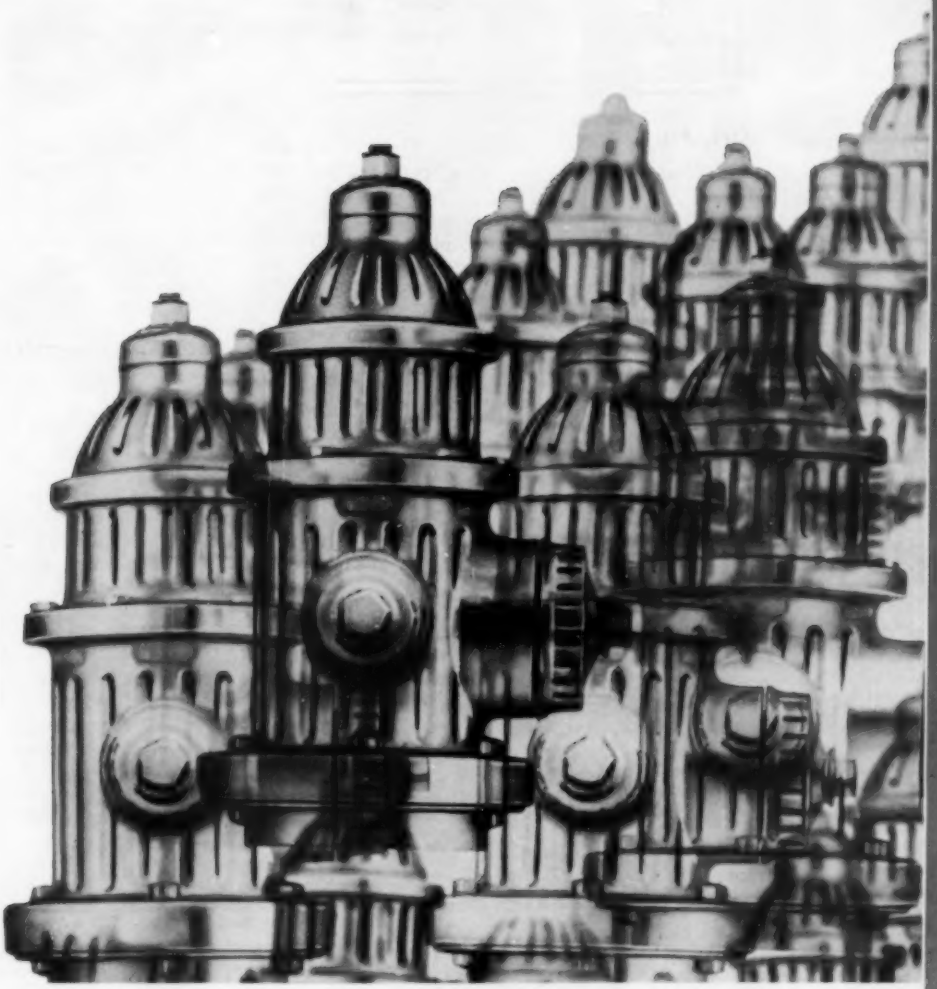

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weighbridge in the laboratory, and by current meters in the field tests. Novel apparatus has been constructed which is small and light for easy transport in field work, which will give satisfactory results in water of high initial conductivity, and which can be operated in pipe lines under high heads. Rapid methods of analyzing the observations have been developed, and as a result it has been found possible to design completely battery-operated detection equipment which should give virtually instantaneous measurement of flow. The laboratory experiments showed that, subject to certain limitations, the apparatus gave results with 95 percent confidence limits of error ±1 percent. The field tests appear to confirm this (Authors' summary).

"Developments In Salt-Velocity Flow Measurement." Par Leslie Young et G. Wilson, National Engineering Laboratory, East Kilbride, Glasgow. *La Houille Blanche*, Sept.-Oct., 1960.

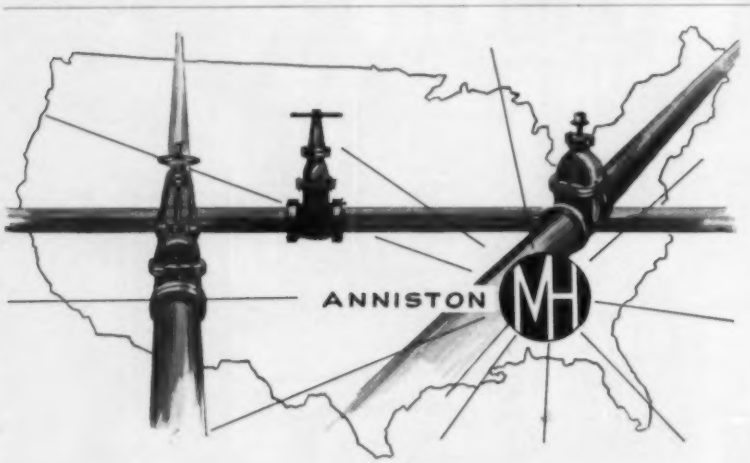
Iron Removal and Softening

The City of Lancaster, O., population 30,000, has a new 6.3 mgd iron removal and softening plant which supplements an existing 2.5 mgd facility, producing an iron-free, ion-exchange softened water. The raw water is obtained from wells located in the flood plain of the Hocking River Valley at a depth of from 80 to 115 feet and has a total hardness of 425 and an iron content of 3.8 mg/L. The iron is removed by discharge of the water to the top of the all-aluminum forced-draft aerators, air being forced up through the water as it splashes down through aluminum slats on its way to the settling tanks. Six manually-operated rapid sand gravity type filters remove the remaining precipitated iron turbidity from the settled water, each filter being equipped with four self-propelled rotating type filter sweeps. Softening is accomplished by means of six down-flow ion-exchange softeners which are regenerated by salt brine when a predetermined quantity of water passes through the softener. Once the regeneration cycle is manually started it automatically goes through brining, slow rinse, rapid rinse and shut-off, and remains inactive until it is manually placed on the softening cycle again. Semi-automatic features are provided as an aid to efficient and continuous operation with a minimum number of operating personnel. The total cost of the new works was $1,400,000.

"Treatment Plant Provides Iron Removal and Softening." By R. E. Peters, Partner, Burgess & Niple, Consulting Engineers and Kenneth W. Cosens, Associate Professor, Civil and Sanitary Engineering, The Ohio State University, Columbus, Ohio. PUBLIC WORKS, January, 1961.

Fish Poisons in Water Supplies

The control of fish in a water supply reservoir by the application of toxic chemicals may be necessary. Cost, ease of application, safety and effectiveness in destroying fish populations are the major considerations in the selection of a compound from the many commercial preparations on the market. The following factors must be taken into consideration: Toxicity of active agents to humans, other mammals, and to fish in household aquariums; effects of fish poison formulations and components on water treatment processes and, conversely, the effects of treatment on these compounds; tastes and odors produced by the components of the formulations; and effects of water quality that may result from decomposing fish. The principal toxic agents in



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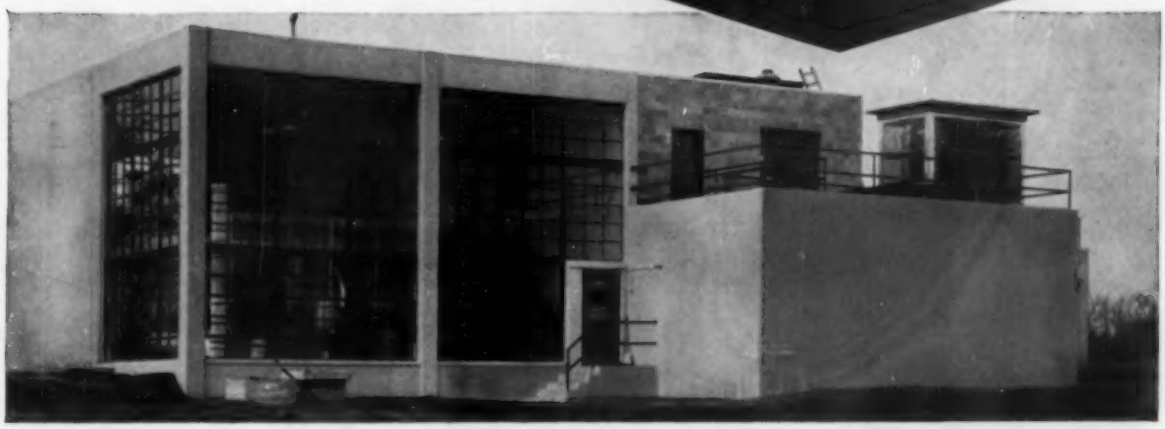

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1950	none	none	
1951	none	none	
1952	none	none	
1953	none	none	none
1954	none	none	none
1955	none	none	none
1956	none	none	none
1957	none	none	none
1958	none	serviced	none
1959	none	none	none
1960	none	none	none
1961	none	none	none

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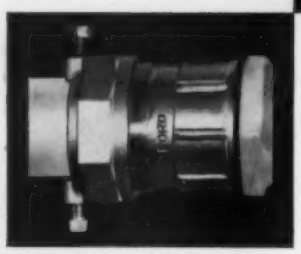
fish poison formulations are rotenone and toxaphene. On the basis of ease of removal of compounds studied, it was found that pure rotenone is the chemical of choice. It is easily removed by moderate amounts of activated carbon and by reasonable amounts of chlorine when 3 hr. of contact time is available. However, declorination may be necessary. Treatment with chlorine dioxide offers another means of removal. Rotenone also disappears quite rapidly in the reservoir from natural causes insuring relatively short critical periods at the water treatment plant. The problems of removal may be more difficult with the use of rotenone formulations, where rotenoid extractives, synergists and emulsifiers are added to the basic ingredient. The use of toxaphene or toxaphene formulations necessitates the removal of practically all the toxaphene at the water plant as none of the toxic agent is removed by natural dissipation in the reservoir. Continuous treatment with high dosages of activated carbon is the only method of removing toxaphene; both chlorine and alum coagulation are completely ineffective.

"Effect of Fish Poisons on Water Supplies." Part 1, Removal of Toxic Materials. By Jesse M. Cohen, Chemist; Lawrence J. Kamphake, Chemist; Armond E. Lemke, Biologist; Croswell Henderson, Biologist; and Richard L. Woodward, Chief, Eng. Sec., all of Water Supply & Pollution Research Branch, Robert A. Taft San. Eng. Center, Cincinnati, O. This is the first of three articles on the effect of fish poisons on water supplies. Parts 2 and 3, to be published in the AWWA Journal, deal with odor problems and a field study, respectively. *Journal AWWA*, December, 1960.



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THE FORD METER BOX COMPANY, INC., Wabash, Indiana

Planning Ahead to Stay Ahead

Spartanburg, S. C., has developed one of the best metropolitan water systems in the Southland through 1) sound and consistent policies of operation; 2) purposeful and visionary planning; and 3) an ample supply of good raw water. The city supply is a soft raw water source obtained from the South Pacolet River whose headwaters lie some 20 miles from the filtration plant Ample rainfall provides plentiful water to maintain good reserves in the two reservoirs during periods of maximum use. The three basic policies of the Spartanburg Water Works are: 1) To provide ample water to meet the demands made against the system; 2) to maintain a flexible and serviceable system to meet the water demand; and 3) purposeful advance planning to meet the water needs of the entire metropolitan county-wide municipal-industrial complex.

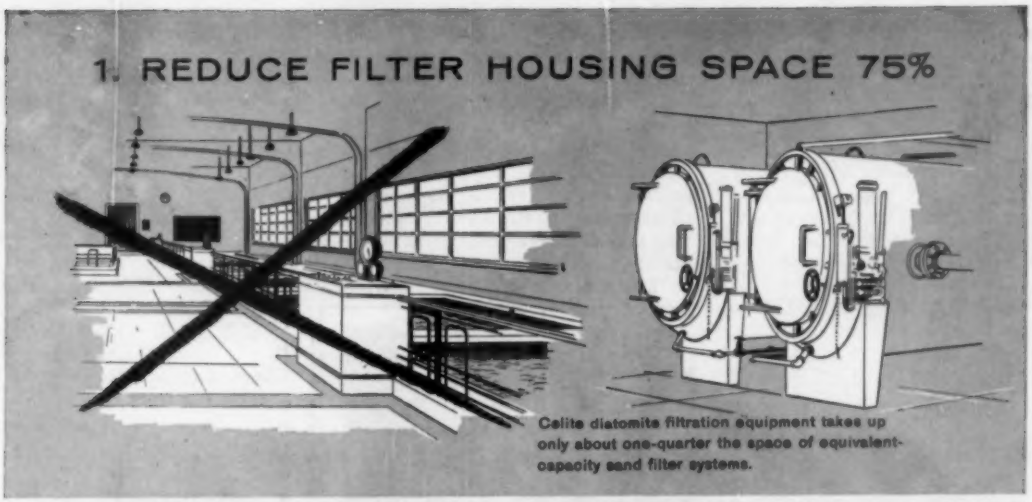
"Planning Ahead to Stay Ahead." By R. B. Simms, Superintendent, Spartanburg, S. C., Water Works. *Water Works Engineering*, December, 1960.

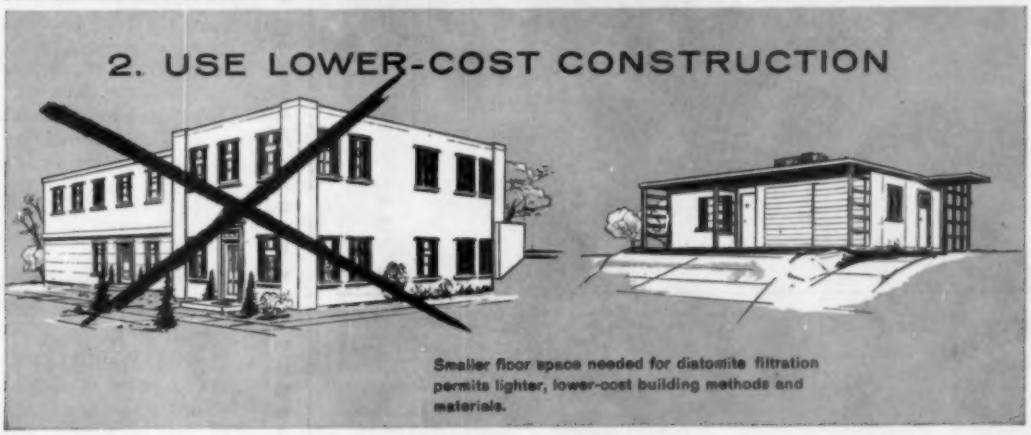
Other Articles

"A New Look at the Substance **Water.**" A look at its structure, new uses and some of the problems. By Frank E. Clarke, U. S. Naval Engineering Experiment Station, Annapolis, Md. PUBLIC WORKS, January, 1961.

"**Demonstration Plants** Will Prove Workability and Cost of Processes." What you should know about **saline water** conversion. Part II. By Allen Cywin, Chief of Demonstration Plants Division, Office of Saline Water, U. S. Department of the Interior, and Lewis S. Finch, Vice President and Chief Engineer, Indianapolis Water Company. Water Works Engineering, December, 1960.

"Growth Can Destroy **Water Earnings.** Periodic rate increases are essential to meet increased operating and construction costs as shown by a survey of 12 privately-owned water com-


1. REDUCE FILTER HOUSING SPACE 75%
Celite diatomite filtration equipment takes up only about one-quarter the space of equivalent-capacity sand filter systems.


2. USE LOWER-COST CONSTRUCTION
Smaller floor space needed for diatomite filtration permits lighter, lower-cost building methods and materials.

You save filtration construction dollars these 2 ways with Celite diatomite

One installation after another proves you need about 75% less filter housing space for equivalent capacity when you use diatomite filtration with Johns-Manville Celite*.

Also, diatomite's lighter, smaller equipment permits you to use lower cost building methods and materials. For example, a simple concrete slab with light framing and siding instead of a large reinforced concrete-and-brick building with built-in concrete filters‡.

Diatomite filter equipment is so compact because it provides a much larger filter surface in proportion to size of equipment. In many cases, raw water can be filtered directly—pretreatment facilities can be eliminated. For Celite removes more suspended solids, including amoebae and algae, and turbidity is usually much lower.

Mined by Johns-Manville from the world's largest and purest commercial diatomite deposit, Celite is carefully processed for purity and uniformity. It is available in a wide range of grades for best practical balance of clarity and flow rate with any suitable filter. For further information, see your nearby Celite engineer. For free technical reprints and illustrated brochure, write to Johns-Manville, Box 14, N.Y. 16, N.Y. In Canada, Port Credit, Ont.

*Celite is Johns-Manville's registered trade mark for its diatomaceous silica products.

‡*See Comparison Studies of Diatomite and Sand Filtration* by G. R. Bell, Journal American Water Works Association, September, 1956 or write for free reprint.

JOHNS-MANVILLE

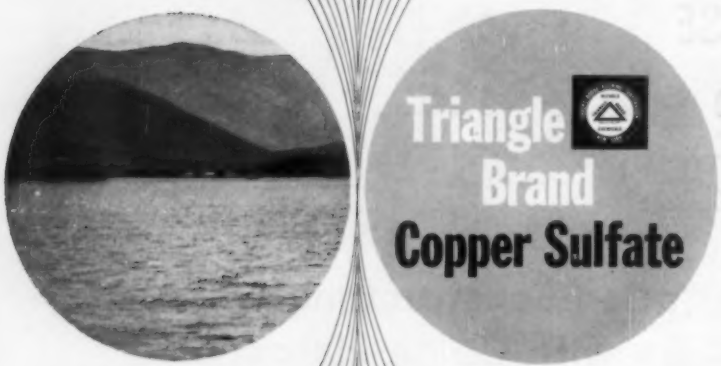
panies. By H. E. Hudson, Jr., and A. W. Sawyer, Hazen & Sawyer, Consulting Engineers. Water Works Engineering, December, 1960.

"Ground Water **Recharge and Conservation.**" A Panel Discussion presented at the AWWA meeting, Bal Harbour, Fla. Effects o. Viscosity and Temperature, Richard T. Sniegocki, Dist. Geologist, Ground Water Branch, USGS, Little Rock, Ark.; Practices on the High Plains of Texas, William L. Broadhurst, Chief Hydrologist, High Plains Underground Water Conservation Dist., Lubbock, Tex.; Conservation in Nassau County, W. Fred Welsch, Eng. Consultant. Journal AWWA, December, 1960.

"Effects of Stimulation on **Well Operating Costs** and Its Performance on Old and New Wells." This article is the third of a series by the author on various aspects of well stimulation. The earlier articles were published in the March and May 1960 issues of the Journal. By Louis Koenig, Research Consultant, San Antonio, Tex. Journal AWWA., December, 1960.

"Household **Detergents** in Water & Sewage." A report of the latest research work investigating the effects of syndets in water and sewage. By P. J. Weaver, Product Development Division, Procter & Gamble Co., Cincinnati, O. and Member, Research Steering Committee Association of American Soap & Glycerine Products, Inc. Water & Sewage Works, December.

control



for algae and aquatic weeds

In small amounts, Triangle Brand Copper Sulfate controls algae growth and kills some of the more troublesome aquatic weeds. They disintegrate where they are, which prevents downstream infestation or clogged waterways.

In sewage pipes, Triangle Brand Copper Sulfate can be used in such low concentrations to control root and fungus growth that surface trees remain unaffected.

Two informational booklets, "The Use of Copper Sulfate in the Control of Microscopic Organisms," and "Copper Sulfate for Root and Fungus Control in Sanitary Sewers and Storm Drains," available on request.

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Graduate Training and Research in Environmental Health Engineering

A bulletin has been issued by the California Institute of Technology, Pasadena, Calif., outlining the programs for graduate education, training and research in engineering for environmental health. The new engineering laboratories, completed last November, provide 1½ acres of area with facilities of special value for graduate students. The program, which is primarily for candidates for a Ph.D. degree, is under the direction of Jack McKee, who is assisted by nine specialists in the various fields.

American Sanitary Engineering Intersociety Board

The next qualifying examination for certification as a Diplomate in Sanitary Engineering will be held May 18, but applications must be received by the Board not later than April 1 or possibly April 3, since the first day of the month is a Saturday. For information on places where the examinations will be held, requirements and forms for application, write American Sanitary Engineering Intersociety Board, Inc., 16th Floor, 33 West 39th St., New York 18, N. Y.

Federal-Aid Highway Program Theme of ARBA Convention

With Federal Highway Administrator Rex M. Whitton as the keynoter and a panel of Congressional leaders starring in the final session, the 59th Annual Convention of the American Road Builders' Association will be focussed, from start to finish, on a discussion of the future of the Federal-aid highway program.

The presence of a new administration in Washington and the expectation that Congress will undertake a complete re-examination of the Federal-aid highway program this year have heightened industry interest in various legislative developments affecting the road program.

The ARBA Convention will be held March 5-8 at the Chalfonte-Haddon Hall, Atlantic City, N. J.

Water Bonus for Payment of Water Bill

Prompt payment of the water bill is encouraged in Florence, Colo., by giving a bonus of 2,000 cu. ft. of water to each customer who pays his bill prior to a certain date. This permits residents to use water more freely on lawns and gardens.

ONE high-speed CASE® W-5 does the work of two smaller rigs ...with up to $2000 less cost!

Sounds almost too good to be true! BUT comparative tests *prove* that, under normal loading conditions, *one* fast-cycling Case W-5 loader, with 1-cu yd high-dump bucket, will move as much pay-yardage per day as *two* smaller capacity outfits mounted on conventional wheel tractors. In addition to saving an *extra* operator, the more powerful W-5 can save you as much as $2000 in initial investment because: (1) it is engineered and built *specifically* for loading and stockpile work; (2) all major components — *including engine and transmission* — are quality-built by J. I. Case Company, instead of being purchased from "outside" sources.

70% more breakout ... plus better machine balance and *double-heat treated, high-clearance axles* enable the Case W-5 to outperform any similar machine in its capacity range ... without danger of axle failure. Rear-wheel power-steer, with short 10'4" turn radius, also insures greatly increased maneuverability.

See one in action ... call your nearby Case Industrial Dealer today for a free W-5 demonstration. Ask him about the convenient Case finance and lease plans, with seasonal skip-payment privileges. Or, *write J. I. Case Co., Dept B1341, Racine, Wis.*, for details.

You pay less than $6700

For a full 1-cu yd loader with Torque-Converter Drive

Complete F.O.B. factory, gasoline-powered model, plus freight and taxes. Slightly higher in Canada. Price subject to change.

You get...

a rugged 3000-lb capacity front-wheel-drive loader with 1-cu yd (SAE rated) bucket, 188-cu in. Case-built gasoline or diesel engine, torque-converter drive, forward-reverse power-shift, rear-wheel power-steer. Comes equipped with big 13.00 x 24, 8-ply drive tires, standard 7.50 x 16, 8-ply rear tires, 12-volt electrical system, front and rear lights, usual instruments. *Optional extra-cost equipment:* 1½-yd light material bucket, pallet fork, block fork, all-weather cab.

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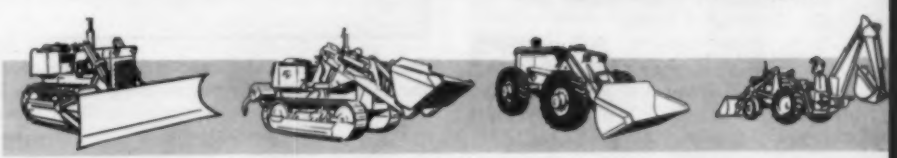

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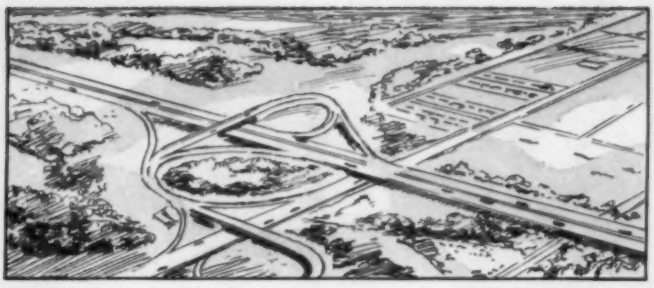


Prepared by **L. G. BYRD,** *Associate Editor*

Freeway Design

Relating the design of freeway entrance ramps to traffic behavior as indicated by the requirements and desires of the driver is a necessity if maximum efficiency and safety in ramp and freeway operation is to be obtained.

Entrance ramp design should provide the following: 1) A flat angle ramp approach which alines the driver along an easy and natural path into the freeway; 2) adequate visibility to allow the entrance ramp driver to judge and accept a freeway gap with a minimum of effort; and 3) a clearly marked and delineated entrance ramp which would eliminate any confusion in distinguishing between the entrance ramp elements and the main freeway lanes.

The concept of considering traffic behavior and driver requirements is applicable to all elements of freeway design. It is essential that freeway operational research be continued and that the results of such research be incorporated into the design of future freeway facilities.

The research work discussed in this paper was performed under the sponsorship of the Texas Highway Department.

"Driver Requirements in Freeway Entrance Ramp Design." By Charles Pinnell, Assistant Research Engineer, Texas Transportation Institute, Texas A & M College. *Traffic Engineering,* December, 1960.

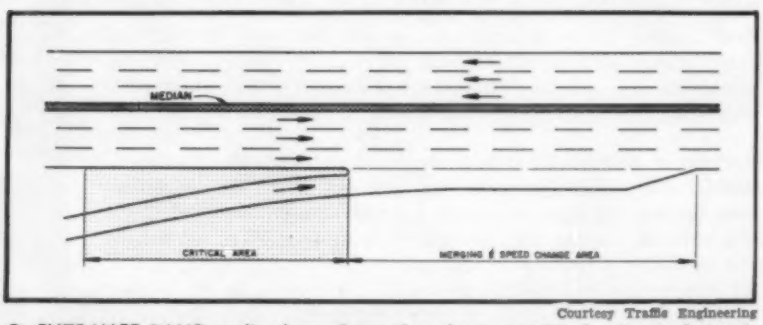
Road Research Track

To help meet the need for practical road research facilities in England, a new road research track has been built at Crowthorne, Berks. The track is three miles long, in the form of a figure eight with a large paved area in the center. It contains a number of different test sections and varying types of road surfaces. There is also a special banked approach bend and straight length designed so that speeds up to 100 mph can be reached. The site will also house the entire Road Research Laboratory. The main objectives in designing the track were: 1) To provide large flat areas with suitable approach roads to enable the stability of vehicles performing maneuvers involving steering, braking and accelerating at normal road speeds to be investigated; 2) to provide facilities for studying the skidding properties of wet surfaces, in particular the material and texture used for the surfaces, the effect of the properties of the tire and the type of vehicle, its speed and braking system; 3) to enable vehicle lighting tests to be carried out on straight and curved roads with surfaces of various types and colors; 4) to enable crash-injury research to be conducted under appropriate conditions; 5) to enable comparisons of street lighting systems to be made under controlled conditions; 6) to provide a continuous circuit around which vehicles can be driven while the actions and reactions of their drivers are studied; 7) to provide facilities for traffic tests of intersection layouts, traffic signals, road signs, safety barriers and other aids to traffic flow; and 8) to provide facilities for the study of vehicle guidance and the many other matters with which the Laboratory is concerned. The track was designed jointly by the Ministry of Works and the Road Research Laboratory.

"The New Road Research Track At Crowthorne." *Roads and Road Construction* (London, England), November, 1960.

Traffic Analyzer

Improvements in geometric highway design have been made possible through a better understanding of traffic performance, driver behavior and highway capacity, obtained from many detailed studies of speed and placement of vehicles in the traffic stream. Accurate and dependable equipment for obtaining this information was developed by the Bureau of Public Roads when, in 1946 the automatic digital recording of data for two lanes of traffic was made available by means of hand-wound solenoids over the keys of a standard adding machine tied-in with a digital clock to indicate the time of each recording. This two-lane digital speed-placement equipment served the Bureau and cooperating state highway departments for 10 years. In 1956 the recording capabilities of the equipment were increased to four lanes and other basic design improvements made to incorporate recently-



Courtesy Traffic Engineering

● **ENTRANCE RAMP studies have shown that the most critical point in design is the area traversed by the entering vehicle before reaching the nose of the ramp.**

$7.50 / hour operates 2 Michigans

Cost averages 20,000 hours, hundreds of different jobs, including plowing, loading of record snow

It all started January 16. Temperatures dropped to near zero. The wind whipped up. Snow began to fall. By dusk, the blizzard had dumped 17 inches on the ground, level measure. Drifts were 6 and 8 ft deep—and growing. Traffic was halted throughout the city—South Bend, Indiana.

Yet, this was only the beginning. By the end of the month, *45.1 inches had been measured.* It was the heaviest snow month, *by 10 inches*, in the 65 year records of the U.S. Weather Bureau in South Bend! A terrific workout was given the City's entire equipment fleet.

Work 18 straight 24-hour days

Among this fleet were two veteran four-wheel-drive Model 75A Michigan Tractor Shovels. These units worked continuously, 24 hours a day, for 18 straight days. They helped clear intersections. They plowed snow too deep for graders and truck plows. They loaded windrows in the downtown area. Their speed and versatility helped the City Street Department post an enviable record—despite high winds, subzero temperatures, and the deep drifts, not a missed garbage collection, milk delivery, or stuck emergency vehicle.

No repairs needed

"Our Michigans did a fine job!" says Dan Richardson, City Street Commissioner. "In the 18 days of continuous work, they stopped only for refueling and changing operators—yet, despite the long hours of work and exposure to moisture, cold and wind, we didn't have to do a thing repair-wise."

Cost includes wages, maintenance depreciation

Operating costs, overall, have also been exceptionally low. The City of South Bend has had the two Michigans for years—one almost six years; the other, almost four. In 20,000 work hours, total, they have had virtually no downtime. Major repairs, for instance, have cost only $1,500—*$2.88 per machine per week!* Tires on the newer machine are original . . . the City sets aside $5 per machine per week for replacement. Other costs, according to department records, have averaged only $3.55 per hour—*including* wages ($1.85), fuel, oil, maintenance, depreciation ($1.00 per hour), and insurance.

Jobs done? Literally hundreds of different kinds. Snow removal. Street rebuilding. Truck-loading of stockpiled gravel, fill dirt, cinders, and salt (5 yd trucks in 2 minutes). Back-filling. Street cleanup. Retrieving jammed sewer buckets. Extinguishing landfill fires. Loading broken concrete.

"No matter *what* the assignment," says Commissioner Richardson, "our experience has proved you can depend on a Michigan Tractor Shovel to get there fast, do the work fast, and without trouble!"

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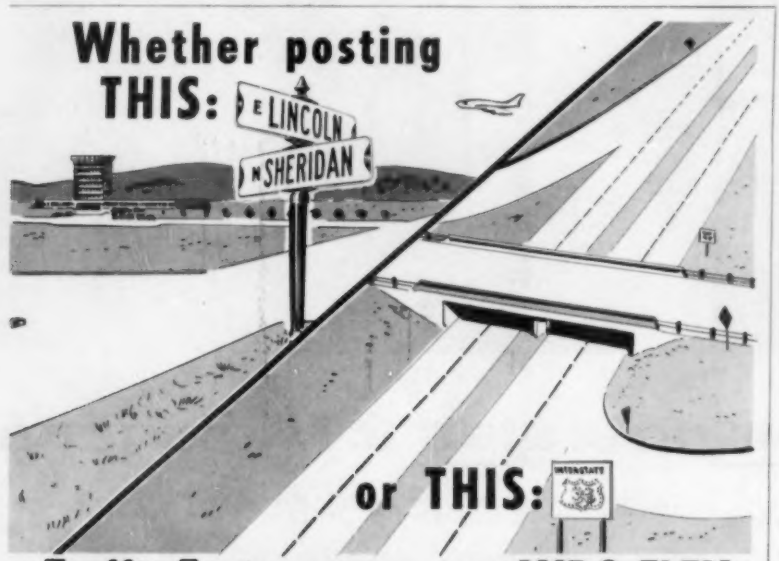
developed electronic components. The data which are automatically recorded for each vehicle are speed, lateral placement referenced to a designated traffic lane and the precise time of day that each vehicle passes the point of observation. Vehicle speed is recorded as travel time in hundredths of a second over the known distance between speed detectors; lateral placement is recorded as a direct measurement of both right and left wheel positions with respect to the right edge of the traffic lane, by the segmented detector; and time of day is continuously measured in intervals of one ten-thousandth of an hour. These recorded data are subsequently taken into the office and interpreted through the use of an electronic digital computer. The first extensive use of the original two-lane equipment took place in 1947 on the San Francisco-Oakland Bay Bridge in California. Since 1948 the traffic analyzer has been employed in a large number of studies in cooperation with at least 24 state highway departments, city and county traffic authorities and a number of universities. Areas of study for which the analyzer has been used include: The effect on traffic operations of various shoulder widths and types; the effect of edge markings on traffic operation; lateral placement guides for the AASHO road test; effect of median dividers on driver behavior and highway capacity; and the truck equivalent factor on various highways. Presently the equipment is being used to determine the relative space that small cars occupy in the traffic stream.

"A Traffic Analyzer: Its Development and Application." Reported by A. Taragin, Chief, Traffic Performance Branch, and Richard C. Hopkins, Chief, Instrumentation Branch, Bureau of Public Roads. *Public Roads*, December, 1960.



Traffic Engineers turn to MIRO-FLEX

New Cut-Out Letters, Numbers, Shapes, Borders for Easy Signing

Miro-Flex offers a wide variety of pre-cut, aluminum individual letters, arrows, numerals, borders, corners, and shapes. Furnished plain or with choice of plastic lenses, reflective sheeting or unfinished. Conform to Bureau of Public Roads' and the American Association of State Highway Officials' standards. Make signs in your shop, or on-site, to interstate specifications.

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Miro-Flex embossed signs are easier to read, have added strength and rigidity. Outlast ordinary flat-surface signs by far. Miro-Flex quality finish is baked on to withstand weather wear. Available plain or reflectorized with moisture-proof beads, reflective sheeting or plastic lenses. Miro-Flex is the finest traffic control sign buy. Competitive makes are . . . rarely as attractive . . . never so enduring.

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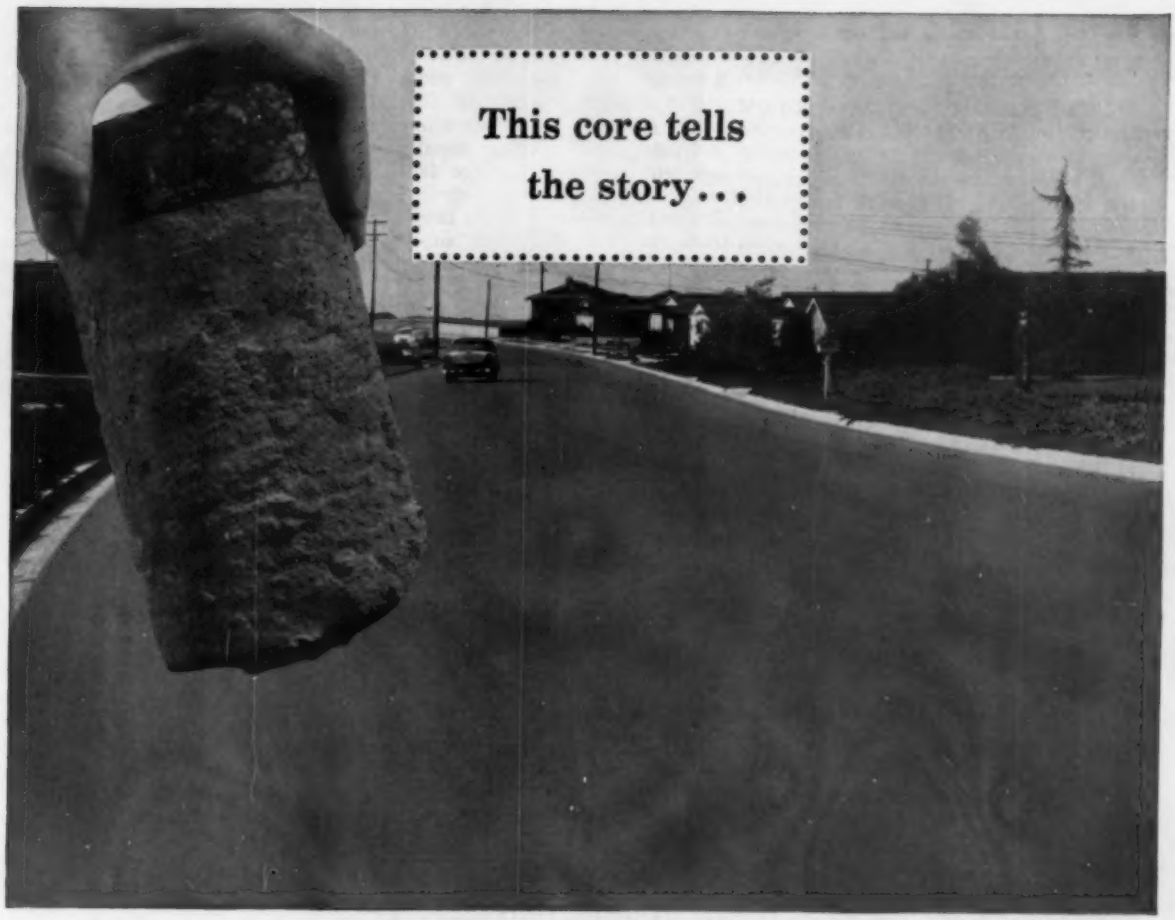
Rubberized Asphalt Emulsion

A program of surface treatment for earth roads is now in its sixth year in South Plainfield, N. J. During the years, variations in base preparation were tried but the original soil proved best. Where clay was in excess of the desired amount, the addition of ¾-inch road stone improved stability. The material cost for maintenance during the five years was $83 per mile and on the roads constructed during the last three years it was reduced to $68 per mile. The seal coating cost $1,320 per mile for materials. The use of the rubber additive cost an additional 1 percent or about $160 per mile for one application at 0.3 gal. psy. Emulsified asphalt grade RS-1 with rubber additive was used for seal coating and MC-D or MC-1 for penetration prior to sealing.

"Rubberized Asphalt Emulsion On South Plainfield Streets." By Charles W. Beagle Borough Engineer, South Plainfield, N. J. *Constructioneer*, December 5, 1960.

Bailey Bridge

The Bailey Bridge, brainchild of a British government engineer, Sir Donald Bailey, is basically a prefabricated throughtruss type steel structure which served effectively during World War II and is finding a continuing value in a civilian role. Consisting of a very few, standard, interchangeable units, the most important feature of the structure is the panel, a 5-ft. by 10-ft. steel truss section. A number of these panels when pin connected, form a continuous girder and two girders, supported by cross beams, called transoms, comprise the simplest form of Bailey Bridge. As many as three trusses can be placed side by side to form a box-type girder and



Core-tested just after completion in 1954 and again in 1958, this street showed a steady gain in strength. Sample shown in photo above was cored in 1958.

Soil-cement pavement grows stronger—strength up to 540 psi in just 4 years

Soil-cement gives more load-bearing strength per dollar than any other low-cost pavement!

Soil-cement is one pavement that really stretches street budgets.

In most cases, 75% of the materials are free! Soil at the site is the main ingredient. Even gravel, or the broken-up old asphalt can be used. This is mixed with portland cement and water, rolled solid and given a bituminous topping. Local traffic can go through on soil-cement pavement the same day it is placed.

Skilled crews using modern machines can build several blocks a day. And maintenance is kept to a minimum because soil-cement doesn't pothole or soften. Best of all, it outlasts all other low-cost pavements—by far!

In the last 5 years, the use of soil-cement for roads, streets, shoulders, subbase, airports and parking lots has increased 250%.

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- *Only one pair of wires is required*
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The Bi-trol controls two pumps over one pair of wires. First signal operates one pump—second signal operates other pump. An alternator can be supplied to equalize pump wear.

The Uni-trol controls a single pump. Type TAE is available with a return signal, to indicate the pump has started.

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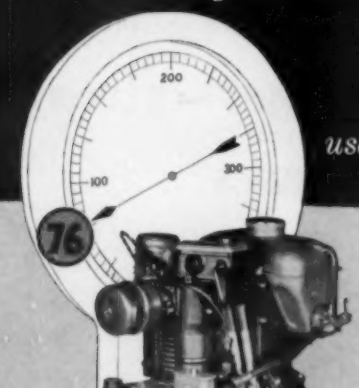
DIESEL POWER



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carrying capacity can be additionally increased by building trusses three deep. Where space allows, the complete bridge is assembled on one bank on a series of rollers and then pushed or pulled forward across the gap. When the bridge is in place, it is jacked down onto bearings. A recent example of the application of this type of structure is that of Scarborough, Ontario where eight men erected a 140-ft. long bridge over a ravine. The completed 10½-ft. wide structure, which provides access to a Metropolitan Toronto Parks Department 165-acre picnic area and offers a direct route for Scarborough Township Roads Department trucks to a sanitary land fill near the park, was furnished and erected for about $36,000.

"Erection of Bailey Bridge Solves Urgent Access Problem." *Roads and Engineering Construction* (Toronto, Canada), November, 1960.

Roadside Maintenance

Landscape maintenance has been approached as an engineering problem by the New Jersey Highway Department with emphasis on proper equipment, use of chemicals, reduced mowing concepts and preventive maintenance. Experimentation in the use of chemicals for weed control, ground sterilization and grass retardation has been encouraging but has failed to reveal exact rules for their use. The proper frequency of application in subsequent seasons is still in question. Sterilization of guardrail areas was tried but, because of erosion, the use of inhibitors was preferred. In evaluating various types of mowing equipment large gang reels were preferred over rotaries where large areas of turf were to be maintained to parkway standards. Quality of turf may be of questionable value where erosion is adequately controlled and weeds are mowed to grass level. New Jersey has as an objective the freeing of maintenance efforts for constructive plantings to improve delineation, reduce headlight glare, control erosion, abate noise and provide living snow fence. Litter removal as an allied project demands attention and maintenance of rest areas will increase with the opening of the Interstate System. In the last fiscal year New Jersey's landscape maintenance costs ran 10 percent of total maintenance costs.

"Roadside Maintenance Problems." Paper by J. F. Andrews, Director, Maintenance and Operations, New Jersey State Highway Department, at the American Association

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CAN BE ELIMINATED LIKE THIS WITH AMIZOL WEED KILLER

and Amizol combinations

Using Amizol alone, or in combination with other weed killers, state and local highway departments are instituting successful and complete vegetation control programs along thousands of miles of roadsides, guard rails, gravel shoulders, bridge abutments, center strips and embankments.

Amizol combinations provide longer control of more broadleaf weeds and grasses than any product used alone. They produce rapid knockdown of existing vegetation, better kill of deep rooted perennials and keep the treated area free of weeds all season long.

Costs for total vegetation control are considerably less with Amizol combinations . . . by 30 percent or more. You use less chemical to kill more weeds. Your "spraying season" is longer, just as long as weeds are green and actively growing.

For information on how to begin a practical highway weed control program, write for free booklet describing uses, application data and chemical formulations of Amizol—produced by Amchem Products, Inc., originators of 2,4-D and other basic weed killers.

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of State Highway Officials' 46th Annual Meeting in Detroit, Michigan.

Highway Progress 1956 - 1961

Since the passage of the Federal-aid Highway Act of 1956 the states and the Bureau of Public Roads have cooperated in the greatest road building program of all time. The challenge is evident in the traffic figures: 65 million motor vehicles in 1956, 74 million in 1960 and 114 million expected by 1976. The 1956 Act assigned as specific jobs the completion of the 41,000-mile National System of Interstate and Defense Highways and the reinforcement of the state primary and farm-to-market roads. Accomplishments include nearly one quarter of the Interstate System now in use, 4,500 miles under construction, 10,000 miles in preliminary engineering or right-of-way acquisition stages, another 11,500 with location studies completed and 5,500 miles with only general route designation developed to date. In addition, construction contracts have been completed on 106,000 miles of ABC roads. Aside from actual highway building, the Federal and state programs have seen 578 research projects completed and 178 others under way including the $27 million AASHO Road Test near Ottawa, Illinois and the intensive Highway Cost Allocation Study.

"Highway Progress, 1956-1961." Address presented by B. D. Tallamy, Federal Highway Administrator at the 46th Annual Meeting of the American Association of State Highway Officials in Detroit, Michigan.

Other Articles

"What Is The Future of **Metropolitan Transportation?**" New concepts, designed to serve the maximum number of people in the minimum amount of space, offer promising solutions to urban traffic congestion. By E. H. Harlow, Vice President, Frederic R. Harris, Consulting Engineers, New York, N. Y. PUBLIC WORKS, January, 1961.

"Traffic Committee Solves **Intersection Problems.**" Experts in traffic engineering, street design and enforcement solve complex problems in Oakland. By Weston E. Follett, Assistant City Engineer, Oakland, California. PUBLIC WORKS, January, 1961.

"Schoolhouse on Wheels for Equipment Operators." **Training program** gives California's highway division a skilled and reliable force of equipment operators. By Frank E. Baxter, Maintenance Engineer, California Division of Highways. PUBLIC WORKS, January, 1961.

"Why **Government Agencies** Need

Their Own Engineering Staffs." By Floyd E. Dominy, Commissioner, U. S. Bureau of Reclamation. American Engineer, December, 1950.

"New York State Thruway Paved with **Bituminous Treatment.**" A 4.10 mile section of the Thruway in Ontario County was resurfaced with a 2-inch binder and 1-inch surface course in 1960. By Ken Smith. Constructioneer, December 12, 1960.

"Motorway **Embankments and Cuttings.**" The relationship of the roadway to the cut or fill slopes affect aesthetics and driving ease. By L. E. Morgan, Horticultural Advisor, Ministry of Transport, England. The Surveyor and Municipal and County Engineer (London, England), November, 1960.

"The Rail **Commuter Problem.**" One of the most serious problems facing metropolitan communities today is that of moving people between residences and business places quickly and economically. By W. W. Patchell, Vice President, Pennsylvania Railroad, Philadelphia, Pa. Civil Engineering, December, 1960.

"Developments in Highway **Maintenance Equipment.**" Changes in equipment used by Illinois reflect modern highway program. By James E. Bell, Equipment Engineer, Illinois Division of Highways. PUBLIC WORKS, January, 1961.

"Fitting the Highway Into the Urban Plan." Through its influence on the community, **highway planning is an integral part of urban planning.** By Ellis L. Armstrong, Commissioner of Public Roads, U. S. Department of Commerce, Washington, D. C. PUBLIC WORKS, January, 1961.

"Snow Removal Contracts and **Heated Pavements** Aid Boston's Winter." Use of city forces, qualified contractors and pavement heating combine to battle New England winter weather. By T. J. O'Leary, Director of Transportation. Public Works Department, Boston, Mass. PUBLIC WORKS, January, 1961.

• • •

One Way to Get Modern Equipment

The City of Brinkley, Ark., authorized the purchase of a street sweeper. The city traded a used cement mixer, a 1953 two-ton Chevrolet truck, a police motorcycle and sidecar, plus $500 for a new sweeper.

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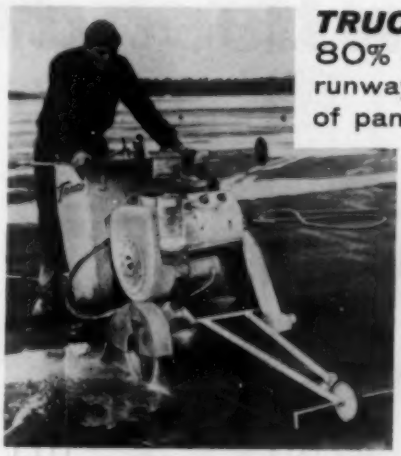

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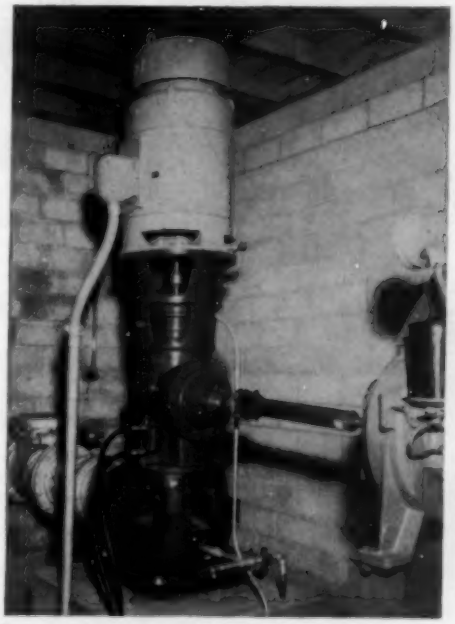

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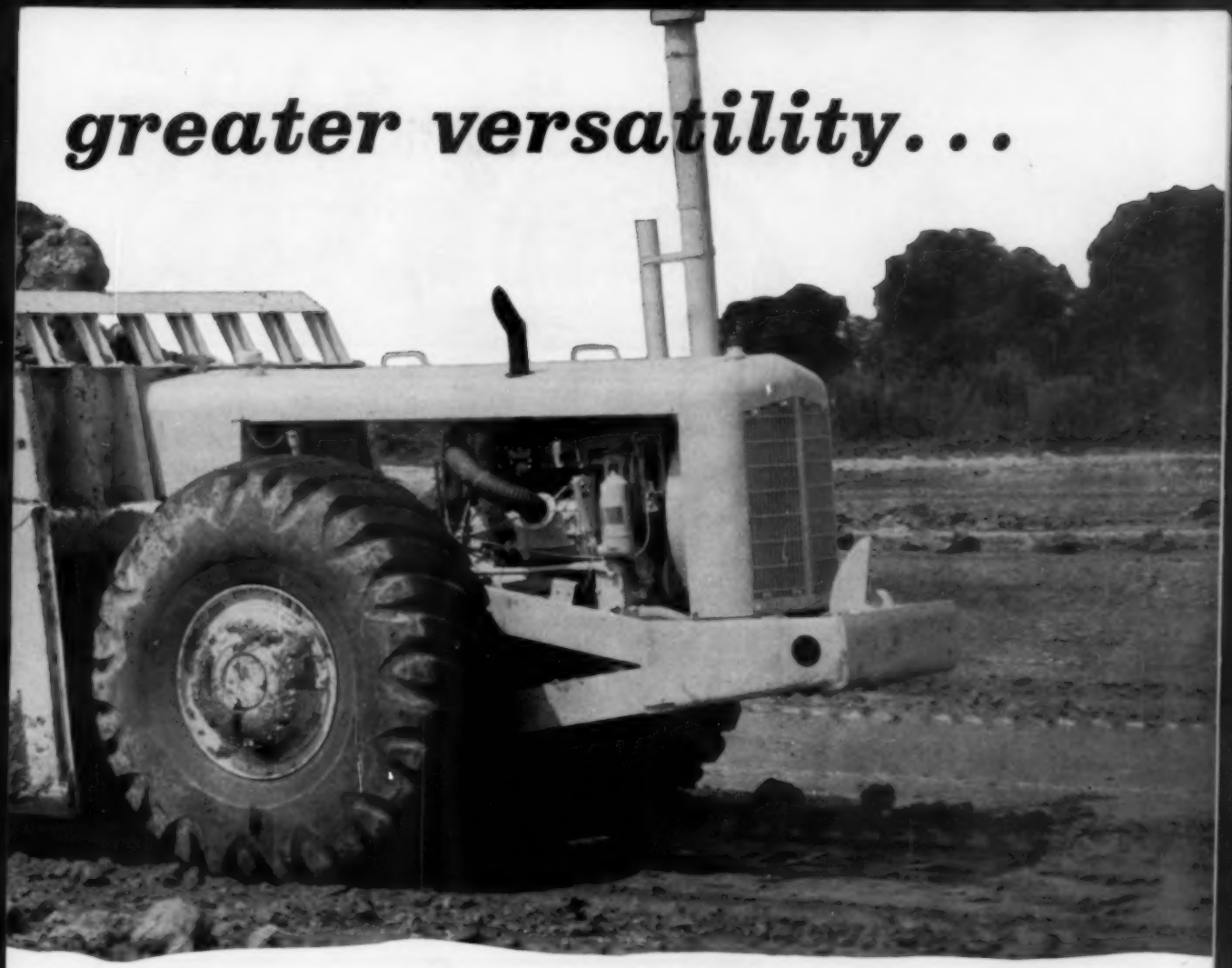

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THE INDUSTRIAL WASTE DIGEST

Prepared by **CLAYTON H. BILLINGS,** *Associate Editor*

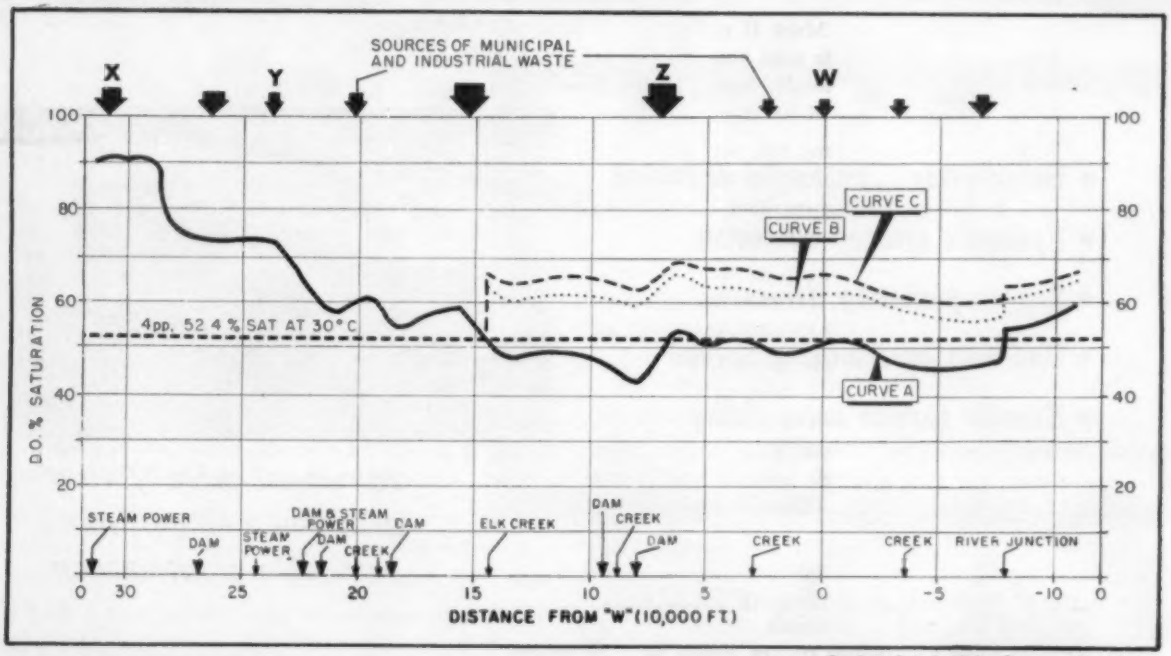
Whey Wastes and Stabilization Ponds

The sewage treatment plant at El Centro, Calif., was designed to include primary settling, separate sludge digestion and ponds for effluent stabilization. Three months after completion, the plant started producing odors, accompanied by sulfide discoloration of nearby houses and precipitation of iron sulfides in the ponds. Experiments were carried out with pilot plant stabilization ponds to determine why the full-scale ponds were not operating in a satisfactory manner. The test program revealed that the primary cause of the malfunctioning was the whey content of dairy wastes discharged to the sewer system. The fact that these wastes had an accumulative toxic effect on the pond also was determined, but the precise reasons for this are not well understood. The high oxygen demand of lactose and sulfate formation from whey breakdown are possibly significant. The addition of nitrates increased the tolerance of the ponds to dairy wastes.

"Effect of Whey Wastes on Stabilization Ponds." By T. E. Maloney, R. A. Taft Sanitary Engineering Center; H. F. Ludwig, Consulting Engineer; J. A. Harmon, Calif. State Department of Health; and L. McClintock, City Manager, El Centro. *Journal WPCF,* December, 1960.

Determining Stream Assimilation Capacity

The phases usually entailed in evaluating the assimilation potential of a stream are: 1) Determining the amount and characteristics of the wastes to be discharged, 2) appraising hydrological characteristics of the river and watershed, 3) studying self-purification factors of the stream, 4) forecasting stream conditions expected for the ranges of waste loading under probable runoff flows and 5) appraising the result of existing and proposed man-made river developments. In studying self-purification factors, deoxygenation and reaeration are considered separately and the combined effect used to plot the dissolved oxygen profile of the river. The procedure is verified by an intensive and well executed sampling program. When the self-purification characteristics are known, it is possible to forecast stream conditions expected for certain waste loadings over the whole range of stream runoff. From the forecasts, a de-



Courtesy Ontario Water Resources Commission

● **FORECASTS of dissolved oxygen profiles of a River in Ohio, showing the effects of 1975 loads with moderate treatment and with pollution minimized by augmenting a drought flow of 316 cfs to 800 cfs in curve A, and to 2,100 cfs in B and C.**

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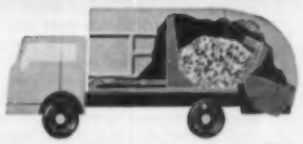

When you start collecting, you position ejection plate at rear of body. As refuse enters, the packer plate forces it against ejection plate. This squeeze continues through each loading cycle. A hydraulic relief valve allows ejection plate to move forward in body.

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Final result — a bigger load because it's uniformly compacted. "Duo-Press" compaction from first to final loads assures full capacity each trip.

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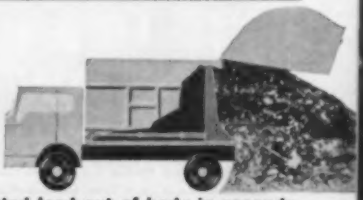

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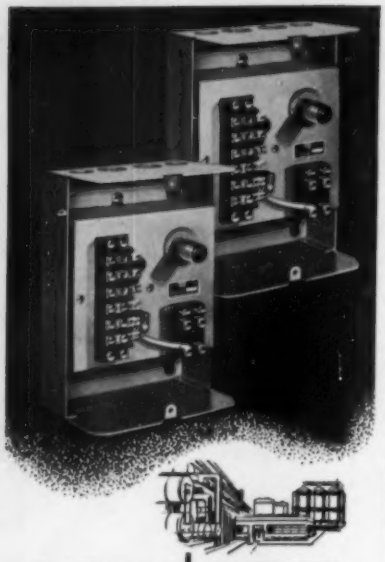

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termination of the desirability of locating a mill on the stream and of its expansion, as well as the effectiveness of various pollution abatement proposals. To effect maximum utilization of the stream, flow augmentation procedures or waste discharge regulation may be found desirable and the potential value of these, too, can be predicted. Depending upon how planned and operated, man-made river developments can be either beneficial or detrimental to waste assimilation potential. A little fore-planning by regulatory agencies with users can result in mutual benefits to users of the stream for all purposes.

"Waste Assimilation Capacity Procedures." By C. J. Velz, University of Michigan. Paper presented at Seventh Ontario Industrial Waste Conference, Ontario Water Resources Commission.

Polarographic Scanning of Wastes

The standard techniques for determination of metals is time consuming, and a method of screening industrial waste samples to confirm the presence or absence of metal ions has been needed. Studies were conducted to evaluate the use of the polarograph for this purpose, considering the detection level of significance as 0.01 mg/L. The recent advent of the Sargent Model XXI polarograph made possible determinations by a dropping mercury electrode that were within the desired range of sensitivity. The instrument has automatic voltage scanning and recording features which permitted the use of a mercury pool electrode in an unstirred solution. The reference electrode used was a small helix of chloridized silver wire. The cell was designed to permit the dropping mercury and pool electrodes to be used interchangeably. The study was conducted on nine metal-bearing samples and results with the mercury pool and dropping mercury electrodes were compared. The investigation was restricted to the detection of lead, copper, chromium, zinc, nickel and cadmium. The results showed that all except chromium can be determined on a semi-quantitative basis polarographically, and the mercury pool electrode was found to be the more versatile. The screening procedure can be accomplished in two to three hours and permits the selection of the proper sample volume for standard analytical procedures.

"Polarographic Scanning of Industrial Waste Samples." By W. W. Ullman, J. D. Porter and W. W. Sanderson, New York State Department of Health. Paper presented at Seventh Ontario Industrial Waste Conference, Ontario Water Resources Commission.

Pharmaceutical Wastes

Many reports have indicated that antibiotic wastes can be effectively treated by biological process, but some of the information on treatment measures has been contradictory. Aerobic handling of penicillin and streptomycin wastes has been reported as successful but anaerobic digestion unsuccessful. The reverse situation has also occurred. One of the considerations is recovering solids high in nitrogen, carbohydrate, phosphate and vitamins. Such solids have value when used in poultry feed, and their recovery reduces the strength of the wastes. The treatment of chemical wastes among pharmaceutical industries includes solvent recovery, waste solvent incineration, solids recovery, biological oxidation, coagulation and absorption, clarification, dewatering, ion exchange dialysis, lagooning and disposal by landfill. Recovery of solvents reduces the strength of the wastes. They can be incinerated if economics do not indicate recovery for reuse. Proper pH adjustment is necessary for precipitation of colloidal chemicals. The precipitate can then be thickened and dewatered by vacuum filters and centrifuges. The use of digested sewage sludge for neutralizing and adsorption in treating complex chemical wastes is the subject of a patent application. Toxic and pathogenic wastes are processed by chlorination and pasteurization plus any liquid-solids separations necessary.

"Handling Wastes from the Billion Dollar Pharmaceuticals Industry." By R. H. L. Howe. *Wastes Engineering*, December, 1960.

Application of Flotation Methods

There are three methods of accomplishing flotation: 1) Adhesion of an air bubble to a suspended particle, 2) trapping of air in a floc as bubbles rise and 3) adsorption of air in a floc during floc formation. Optimum results with method 1 requires dissolving the air into the waste stream. Method 2 is enhanced by increasing the size of the floc structure. In method 3 the floc is formed after pressure is released in a dissolved air solution. Dissolved air flotation systems fea-

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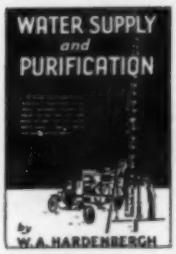

Water Supply and Purification

By W. A. Hardenbergh

Among the major changes introduced in this latest edition are the following: The chapters on ground water, on filtration, and on laying pipe and maintaining lines have been almost completely rewritten; the chapters on pipe conduits and on disinfection have been revised to bring the material in them up-to-date; and a new chapter has been added on fluoridation. Design examples of all kinds are worked out in detail to illustrate practical, up-to-date methods. To order your copy circle C-1 on the coupon.

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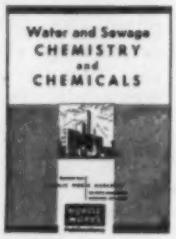

If you are not an expert chemist but want a dependable text on chemistry as applied to sewerage and water works—send for this valuable reprint today. Written in plain language so anyone can understand it. Four color illustrations are used to show the exact nature of colorimetric reaction in some specific laboratory tests—something that is possible only with this type of work. Of special interest to water or sewage plant operators. To order your copy just circle number C-2 on the handy coupon.

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Principles of Soil Engineering

By Robert F. Baker

A knowledge of soils and soil engineering is important for all who deal with earth for engineering problems. Rarely is a structural design evaluated without recognition of the soil characteristics affecting foundation requirements. Without attempting to develop detailed concepts and procedures, Professor Baker has presented a comprehensive discussion of the subject of soil behavior in terms of basic principles. To order your copy of this informative 40 page booklet just circle number C-3.

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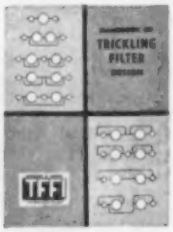

This is the fourth edition of this informative and valuable 38 page Handbook. It has been completely revised, rewritten and brought up to date. Among the many subjects included are General Design, Media, Drainage and Ventilation, The Aerofilter: Description and Design Data, Standard Rate Filters, General Design for High Rate Filters, The Biofiltration System, The Accelo-Filter System of Wastes Treatment. A Nomographic Solution for Trickling Filter Design. Just circle number C-4 on the coupon.

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Water systems to serve small communities, institutions, camps, turnpike service areas and isolated commercial establishments present special problems for the designer. In this excellent 28 page reprint the author considers design standards, equipment, filtration, sources and treatment, quality problems, pumping distribution, coagulation and settling, operation control, storage and related factors for systems capable of supplying 15,000 to 200,000 gallons per day. Just circle number C-5 for your copy.

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ture pressurization to aid the solution of air and de-pressurization to release the air as bubbles. The systems require a pump for pressurizing the waste stream, facilities for injecting air into the suction of the pressurizing pump, chemical feed apparatus (if waste characteristics require), retention or contact vessel to attain maximum possible saturation of air, back-pressure regulator and flotation unit. The entire waste stream or a portion may be pressurized. The latter method, which requires blending of the two portions of the waste stream, is employed where higher solids to gas ratios are permissible. It has the disadvantage of requiring a high flotation surface area to accommodate the quantity of waste being recirculated. With extensive field results available on dissolved air flotation procedures, necessary design correlations have been established. Laboratory studies may be used to size flotation units, if it is considered that the correct hydraulic rate under field conditions is 1.5 to 2.5 gpm per square foot, while 3 to 4 times that rate is permissible under laboratory conditions. Examples are given of treatment experiences with wastes of oil refineries, rendering plants, steel mills (oily) and slaughter houses and with wastes in the presence of sewage.

"Application of Flotation Principles to Several Industrial Waste Treatment Problems." By J. W. Pratt and E. R. Vrablick, Process Engineers Div., Eimco Corp. Paper presented at Seventh Ontario Industrial Waste Conference, Ontario Water Resources Commission.

Non-assimilable Waste Problems

Stream contaminants which are challenging the sanitary engineering profession are those which are not destroyed in waste water treatment, those which are not subject to the natural purification abilities of streams or ground water aquifers, and those which water treatment plants cannot remove to below the tolerance limit of the consumer. The synthetic chemicals which either are toxic to bacteria or are not usable by bacteria as food and thus upset the natural purification cycle, fall into the first two categories. Soluble salts (other than bicarbonates) introduced by industrial effluents and soluble organics are in the third. Ion exchange or distillation will remove some of these and adsorption and extraction, others. But such tertiary treatment methods do not fit into the pattern of present costs of water or waste treatment. In cases where synthetic organic chemicals, such as detergents, are widely used in households, petrochemical and chemical industries should direct their research toward production of compounds which may be broken down by microorganisms. Some secondary treatment processes such as activated sludge are 90 percent effective in removal of most organics.

"Research and Treatment Technology." By Rolf Eliassen, Massachusetts Institute of Technology. Paper presented at the National Conference on Water Pollution, Washington, D. C.

Other Articles

"Oxidative Abilities of **Aniline- acclimated Activated Sludge.**" By George W. Malaney, The Ohio State University. Studies were made on the ability of activated sludge organisms to acclimate to compounds representing basic chemical structures and the capacity of aniline-acclimated sludge to oxidize other chemical compounds related in structure. Journal WPCF, December 1960.

"Controlled **Mine Water** Drainage." By R. E. Steinman, Jones and Laughlin Steel Corp. Industrial Water and Wastes, Nov.-Dec., 1960.

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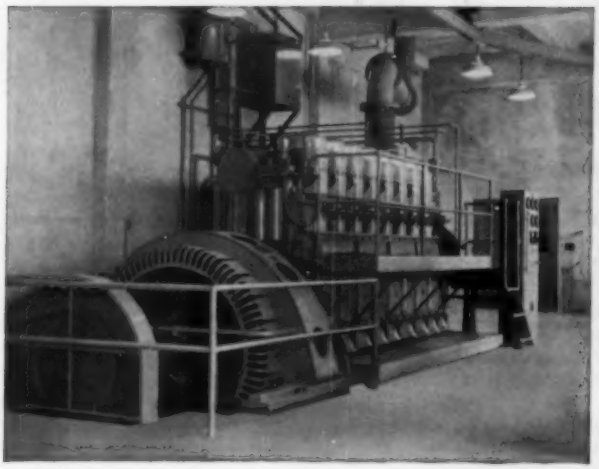

First fully automatic unit of its type in the U.S., this Enterprise standby plant also powers drainage pumps in case of airfield flooding.

Compactness of the Enterprise engine enabled easy installation in the existing building.

Power failure at this busy new $50,000,000 International Airport would create emergencies of major proportions. But with the Enterprise diesel-electric, *fully automatic* standby generator set now in operation, this will not happen. Within 13 seconds, if power fails, the Enterprise cuts in to supply all the power needed for normal operation of control tower, runway lights, and other essential airport facilities.

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Further proof of Enterprise adaptability and vibration-free operation is shown by the use of the concrete cradle which was an integral part of the building.

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INDUCTION MOTOR TYPES AND CHARACTERISTICS

BRUCE J. ENNIS
Associate,
Burns & McDonnell Engineering Co.,
Kansas City, Missouri

THE THREE PHASE squirrel cage induction motor is the "workhorse" of industry. Ranging in size from fractional horsepower to hundreds and even thousands of horsepower, they provide the power to drive the gamut of mechanized equipment, from a pump on the farm to a rolling mill in a steel plant.

Induction motors are so common that they are often taken for granted, and expected to perform satisfactorily, year in and year out, under adverse environmental conditions for which they were not designed, in applications where the requirements of the driven equipment are not properly matched by the motor, and in electric circuits which provide the motor with a substandard supply of power.

In most cases such as these, especially in the application of motors for pumping equipment in water or sewage plants, for auxiliary equipment in power plants, and for industrial plants served by the electric utility system, a brief summary of the available types and operating characteristics of motors may be useful in the determination of the proper motor to be used in specific applications, and of the acceptable variations in power supply furnished by the municipal system.

The National Electrical Manufacturers Association acts as a clearing house of desirable standards for the manufacture and application of motors. Such standards define the construction, operating characteristics, and performance of motors which have been adopted universally by manufacturers and users of motors as follows:

Types of Motors

The construction of motors which have been developed over the years to fit specific environments in which they are to be installed and operated includes the following general types, among others:

Drip-Proof Machine: In this type of motor, the ventilating openings are designed so that liquids or solid particles falling on the motor at an angle not greater than 15 degrees from the vertical cannot enter the machine. This is the most widely used type of construction. It is suitable in non-hazardous surroundings which are reasonably free of dust and chemical fumes.

Splash-Proof Machine: This is similar to the drip-proof motor except that the design of the ventilating openings prevents entrance of liquids or solid particles coming towards the motor at an angle not greater than 100 degrees from the vertical. It is suitable for use in areas where splashing liquids may be encountered such as where floors may be hosed down in ice plants, dairies, paper mills, packing plants, etc. It is also suitable for outdoor installation except in locations where drifting snow may enter the machine.

Weather-Protected Machine: This type of motor is designed to minimize the entrance of rain, snow, and air-borne particles into the electric parts. It is available in the standard Type I design, or in the Type II design, which contains special additional baffling in the internal ventilating passages to prevent contamination from high velocity air-borne particles resulting from high winds or storms. As its name implies, it is suitable for outdoor installation.

Totally Enclosed Machine: A totally enclosed motor is designed with the electric parts completely housed to prevent the free exchange of air between the inside and the outside of the case. It is available in four types of construction such as: Non-ventilated, in which heat is dissipated by the shell of the motor itself; fan-cooled, in which an integral fan blows ventilating air across the outer shell; explosion-proof, which is designed to withstand an explosion of a gas or vapor within it and to prevent the ignition of a gas or vapor external to the machine; and dust-ignition proof machine, which provides equivalent explosion protection in combustible dust atmospheres. Non-ventilated and fan-cooled motors are suitable for operation in non-hazardous locations containing abrasive dusts or chemical vapors, and for outdoor service. Explosion-proof machines are designed to operate in atmospheres containing explosive gases and fumes; and dust-ignition proof motors are for use in areas containing combustible dusts such as carbon, coal, flour, and explosive metal particles.

In motors installed in humid atmospheres or in outdoor service, it is general practice to include space heaters arranged to keep the motor warm and prevent condensation at times when the motor is not in operation. Premium insulations of the epoxy encapsulation type are also available to provide additional resistance to moisture, chemical fumes and abrasive materials on drip-proof motors, and special water-repellent insulations are available for other types of motors.

As a measure of the relative costs of the above motor types, with a 25 hp, 440 volt, 1800 rpm three phase squirrel cage motor as a base, a splash-proof, a totally enclosed fan-cooled, and an explosion proof motor might be expected to cost 108.5%, 138.5%, and 160%, respectively, of the cost of a standard drip-proof motor.

With Class A insulation, motors operating in an ambient temperature of 40 C (104 F) are designed for continuous operation with a temperature rise by thermometer readings not to exceed 40 C for drip-proof motors, 50 C for splash-proof, and 55 C for total enclosed motors. For operation in locations of higher ambient temperatures, motors may be provided with Class B or Class H insulations. With Class H insulated motors, special precautions should be taken to assure suitable bearing lubrication under the higher

temperatures at which such motors operate. Taking into account allowances for hot spot temperatures (which are in excess of thermometer readings), the total maximum allowable temperatures for reasonable insulation life is approximately 105 C, 130 C, and 170 C for Class A, Class B, and Class H insulated windings, respectively.

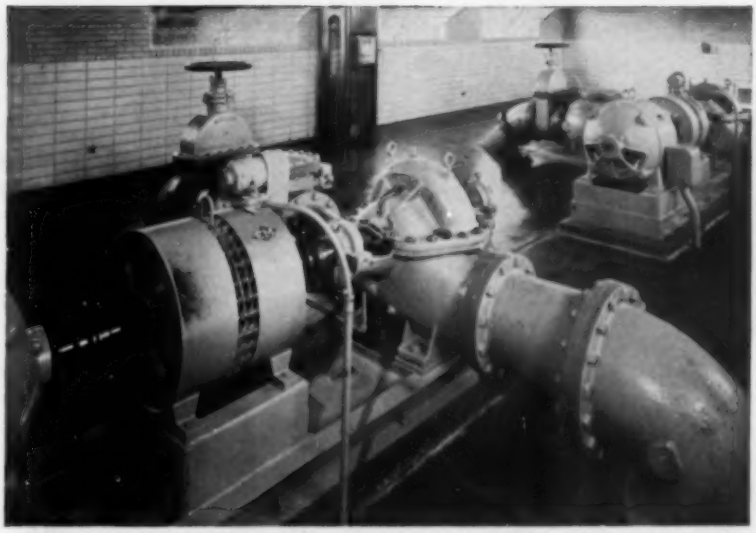
Operating Characteristics

In accordance with National Electric Manufacturers Association standards, alternating current motors are designed to operate satisfactorily at rated load with a combined variation in the voltage and frequency up to 10 percent above or below the rated voltage and frequency, provided the frequency variation does not exceed 5 percent. Under such variations, motor operation will not necessarily be in conformance with performance standards applicable at rated frequency and voltage.

As an example, a 220 volt induction motor, operating in a 208 volt system, will draw about four percent more line current at rated load, but will deliver about ten per cent less breakdown torque than it would when operated at 220 volts. With constant frequency, (as is common on most utility systems) such a 220 volt motor would operate satisfactorily at a voltage 10 percent below rated voltage, or at 198 volts; therefore, it is permissible to use 220 volt motors on 208 volt systems where the minimum voltage is maintained at 198 volts, or above, and where the reduced torque output of the motor is sufficient to operate the driven equipment.

Locked rotor and pull out torque vary as the square of the voltage applied to a motor. Thus, an increase in voltage to a value of 110 per cent of nameplate rated voltage will result in an increase in torque of 21 percent above normal rated torque. Conversely, a 10 percent decrease in applied voltage will reduce the motor's rated torque by 19 percent.

Under such conditions, the rated temperature rise may be exceeded although the motor winding temperature will not exceed safe limits provided the ambient temperature is at or below 40 C. In general, applied voltages which are 10 percent higher than nameplate rating will reduce the motor's rise by about 3 to 4 C, and voltages which are 10 percent below normal will cause an increase in temperature rise of from 6 to 7 C. Therefore, a drip-proof (40 C rise) motor rated



E-M Ampli-Speed Drives provide Odessa, Texas Municipal Sewage Plant with adjustable pumping rate of 1 to 5.4 MGD. Pumps are held to ±2% of manually selected speeds.

Make two pumps do the work of three!

Here's how Odessa, Texas did just that with adjustable speed E-M Ampli-Speed Drives

PROBLEM: Odessa, Texas wanted to increase sewage facilities to treat sewage effluent as a source of industrial water for chemical and rubber plants.

OBJECTIVE: They needed a new, efficient sewage pumping station at minimum cost, with provision for future capacity.

SOLUTION: Odessa officials called in Parkhill, Smith & Cooper, consulting engineers of Lubbock, Texas. P. S. & C. suggested two alternatives: 1. Build a plant with three pumps, including one for peaking and standby; or 2. Install two pumps with E-M Ampli-Speed Drives.

Parkhill, Smith & Cooper favored the 2-pump plan for these reasons:

Minimum Capital Investment. The three-pump plan would tie up a considerable amount of capital in an extra pump, motor and control without adding appreciably to the volume of sewage pumped.

100% Peak Standby Capacity. Two pumps with E-M Ampli-Speeds could handle present demand efficiently, yet still have enough reserve capacity for 100% peak standby.

Low Cost Expansion. Later another pump could be added to *double* the station capacity and still allow 100% peak standby. And as a further saving, the building would *not* have to be enlarged to accommodate this third pump.

RESULT: Odessa took the advice of its consulting engineers and is now enjoying efficient, low cost pumping.

As your pumping requirements grow, you too will want the economy and versatility that E-M Ampli-Speed Drives give you. Write the factory today for descriptive Ampli-Speed Bulletin No. 243, and call your nearby E-M Sales Engineer for details.

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220 volts might experience a 47 C temperature rise while operating at 198 volts.

The full load slip of induction motors will decrease about 17% when the applied voltage is 10% above nameplate rating, and will increase about 21% when the operating voltage is 10% below normal. Thus, a motor driven pump, operating at 90% of rated voltage might be expected to have an increase in slip from a rated value of, say, 5 percent to a slip of 6.05 percent. On an 1800 rpm basis, this would be equivalent to a reduction in pump speed from a normal 1710 rpm to only 1691 rpm at the reduced operating voltage, and might result in a substantial reduction in the gallons-per-minute pumped, especially for pumping units with a flat head-capacity characteristic.

Motor efficiencies at full load will increase from ½ to 1 point when the operating voltage is 10% above the nameplate rated voltage, and will decrease about 2 points when the voltage applied to the motor terminals is 10% below normal. In the latter case, the additional current (and copper loss) at the lower operating voltage condition more than offsets the reduction in iron loss resulting from the lower magnetizing voltage applied at the motor terminals. Conversely, the full load power factor of a motor will decrease about 3 points when the applied voltage is 10% above nameplate rating, and will increase about 1 point when the applied voltage is only 90% of normal.

For a 10% variation above normal rated voltage, the full load motor current will decrease about 7%. If the applied voltage is 10% below normal, the full load current might increase as much as 11%.

As a general principle, a squirrel cage induction motor of a particular size and speed draws approximately the same number of KVAR's, or reactive volt-amperes, whether the motor is idling or running at full load. Thus a 10 horsepower motor, with a reactive power requirement of 3.5 KVAR at full load, would still draw 3.5 KVAR from its power supply circuit, even if the motor were completely unloaded and it was running idle. This, of course, would result in a low power factor on the supply system circuit.

A similar situation applies if the motor installed on a driven machine is too large for the power requirements of the machine. For this reason, it is desirable to select motors with horsepower ratings which closely approximate the machine to which they are connected. By so doing, the general level of system power factor is improved, with better voltage regulation, lower line losses, and better economy.

• • •

What Is Found in a Parking Meter

Four penny-sized discs, evidently from a charm bracelet, were found in a Corning, New York parking meter. Each of the discs was engraved with one of the Ten Commandments; but "Thou shalt not steal" was not among them reports Philip Grannan, Superintendent of Public Works.

• • •

European Composting

(*Continued from page* 110)

original Earp-Thomas composing concept. Plants using this concept are now operating in Verona, Italy, Aguas Calientes, Mexico and Muttnz, Switzerland —Ed.)

The Dano Method. The Dano biostabilizer system is the most widely used in this class. The forerunner, the Dano egsetor system, merely processed the refuse for composting which was to be done by the farmer. The egsetor is a rotating drum (12 rpm) sieve about 4 m. (13 ft.) in diameter. It provides preliminary grinding and screening of the refuse(16). The last egsetor plant was built in 1955, but in 1953 the Dano Company introduced the biostabilizer, designed to accomplish continual mixing, aeration, grinding, and decomposition in one unit(16). The biostabilizer retains the refuse or refuse-sludge materials for three to five days in a slowly rotating drum provided with a blower and one or more air manifolds. Drum diameter is usually 9-12 ft. and length in excess of 60 ft. Most units are operated at about 0.8 rpm during the day and either intermittently at this speed or continuously at 0.25 rpm the remainder of the time.

Biostabilizers are operated more than half full. Rotation provides slow mixing and aeration. Air is supplied by a stationary or drum-mounted (earlier design) blower. It enters through lengthwise manifolds with air valves, which are adjustable from the outside, at frequent intervals. The crude refuse generally is subjected only to sorting and magnetic separation before being charged into the unit. Water or sludge is added at the inlet. Mixing is provided by the unit. Slow grinding is accomplished by the tumbling, shearing action, decompo-

sltion occurring within the unit. The outlet end consists of a short section of drum with coarse perforations (about 4 in. diam.) with a stationary housing. A fairly large opening, with adjustable gate, between main unit and perforated section permits compost to be discharged to the screen section. Decomposition temperatures, indicated by dial thermometers set along the length, should reach a maximum of over 130° F.

The biostabilizer is generally followed by a secondary magnet, a vibrating screen, a ballistic or gravity separator, and windrow composting or curing. Some plants are provided with considerably less processing equipment; none has specific grinding units (except at the Sacramento County, California, plant where it was found that U. S. refuse required pre-grinding). The Bad Kreuznach plant provides only screening in addition to the biostabilizer, while the Chur plant merely provides magnetic separation with screening only in winter to remove ashes. The Enschede plant is the most elaborate, providing in addition to the above: incinerator, paper grinder, sludge centrifuge and an egsetor (following the biostabilizer).

Although at some plants the processed compost from the biostabilizer is sold immediately, the compost is not sufficiently decomposed even after 5-day retention to be stable. It will continue to decompose when moist, often reheating to higher temperatures than occur in the drum. Unless used as hotbed manure or applied immediately to the soil, it is usually further composted or cured in windrows. Still, the continuous mixing-positive aeration system provides the fastest composting and, in the author's opinion, 5-7 days composting in such a unit is about the equivalent of 3-4 weeks of windrow composting with several turnings.

The Calais System. This unique system, operating at Calais, France, cannot be classified into one of the three general processes already discussed. Refuse, after grinding, is deposited by a pivoting belt conveyor in a huge circular windrow beneath a movable shelter. Water and forced air are provided within the shelter. The whole shelter, about one-fifth of the circle in length, is mounted on wheels and rails. It is moved along with the pivoting conveyor, and requires about a year to make a complete circuit. Composting occurs beneath the shelter for about

(*Continued on page* 162)

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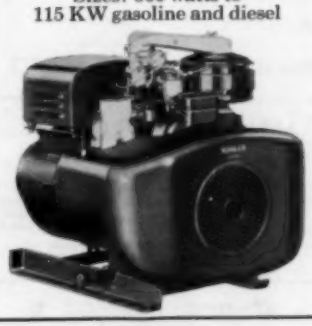

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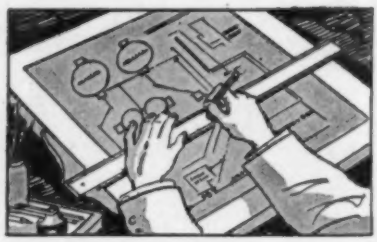

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2½ months and then in the open as the shelter leaves it behind. There is no turning. The system might be described as forced-air windrow composting, followed by in-place windrow curing. The French have a more exotic name for it which may be translated as "accelerated zymothermic fermentation."

Costs and Selling Prices

Table 2 presents some cost and selling price data, converted to U. S. dollars and short tons. There are a great many factors involved: interest rates, foreign wage scales, etc., that may permit no direct comparison to U. S. costs. There also are questions of over or under-designing which may account for great errors in calculating costs on a per capita or per ton basis. For example, the Delft plant has dual equipment, except for receiving bunker and sorting belt. However, one set could deal with all of the refuse. The Hengelo plant has two each of rasping machines and roller crushers, but one set can process all refuse. The extent to which a plant "refines" the compost can materially add to the capital and operating expenses while not necessarily affecting the degree of decomposition provided. Finally, the size of plant and whether or not it is a prototype is of importance.

The van Maanen system, designed for large installations in remote areas, is the least expensive to build and operate per unit. Generally the Dano method is more costly to install than the rasping system. Dr. Straub at Baden-Baden estimates the following costs of construction: Baden-Baden process, 6 Deutsch Marks (DM) ($1.43) per capita; rasping system, 10 DM ($2.38) per capita; Dano method, 15-16 DM ($3.57-3.81) per capita. Mr. Horstmann at Heidelberg proposes the construction of a new rasping system plant of 150 tons/day capacity at an estimated cost of 1.5 million DM ($357,000) or $2,040/short ton of capacity.

The cost data above and in Table 2 appear to be somewhat low for U. S. construction and operation based on an unpublished cost study made in March, 1959, by the writer for plants of two types. However, the Savannah, Georgia, estimates indicated construction and operating costs, including amortization, to be roughly of the same range as U. S. incineration and sanitary landfill costs without an allowance for sale of compost.

General European practice is to compost in publicly owned and

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operated plants, to sell the compost in bulk at the plant at less than $5.00 per ton, and to make no attempt to profit on refuse disposal. There is a sharp contrast between this and present composting practice in the United States.

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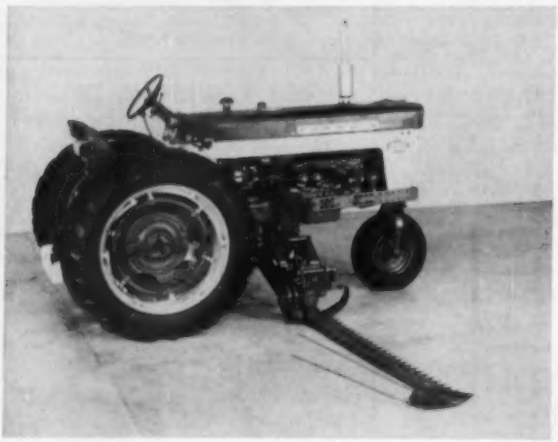

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Circle **No. 2-1** on the convenient reply card facing page 34.

Dynahoe

This loader-tractor-backhoe, constructed as one completely integrated unit, features extra heavy frame, buckets, booms and dipper; adequate tire flotation, proper weight distribution, power-shift forward and reverse transmission, torque converter, power steering and comfortable operator's seat. Struck capacities are 7.5 cu. ft. on the backhoe and ⅞ cu. yd. on the loader.

The Hy-Dynamic Co., Lake Bluff, Illinois.

Circle **No. 2-3** on the convenient reply card facing page 34.

Light Control

These photoelectric light controls are light-sensitive switches which automatically turn on outdoor lighting installations, such as street lights, at predetermined levels of darkness and turn them off when they are no longer needed. Series 4005 is the basic control; 4006 series controls are equipped with an electric timer to preset any desired "off" period and temporarily override the photoelectric cell. The light level setting is adjustable from ½ to 4 footcandles. Normal factory setting is 2 footcandles. Encased in a weatherproof, shock-resistant butyrate housing, the control operates through a temperature range from —40°F. to 165°F. It is available with either a standard 3-prong locking-type plug which meets EEI-NEMA specifications and carries a 15-ampere load, or with color coded 14-in. pigtail leads which will carry the full 30-ampere current capacity of the mercury switch. The units are available with optional 2-in. slipfitter or mounting brackets.

Revere Electric Mfg. Co., 7420 Lehigh Ave., Chicago 48, Ill.

Circle **No. 2-2** on the convenient reply card facing page 34.

Sign Fastener

Use of high-strength Huckbolt fasteners to assemble highway signs substantially reduces installation time and maintenance costs for state highway departments. In addition, the new method results in a better job and eliminates pilfering of bolts and signs.

State trucks equipped with air compressors and tanks permit assembly and erection of signs right on the job. The supporting frames are assembled on location, thus permitting greater payloads per trip. Installation time per sign is substantially reduced, providing considerable savings in labor costs and on-the-road living expenses.

The Huckbolt fastener is used to

achieve the cost reductions by combining the desirable features of both a bolt and rivet. It is a two-piece design, consisting of a pin and a collar.

In installation the pin is inserted from one side of the work; the ungrooved collar is slipped over the projecting pintail from the other side. The pneumatic installation tool, then applied, has internal jaws which grip the pintail and pull, while the nose of the tool seats on the Huckbolt collar.

Maintenance crews, who work from pick-up trucks not equipped with air compressor units may use a hand powered tool or portable carbon dioxide bottles and pneumatic tools to install the Huckbolt fastener for repair and service work.

Huck Manufacturing Co., 2480 Bellevue Ave., Detroit 7, Mich.

Circle **No. 2-4** on the convenient reply card facing page 34.

Utility Trencher

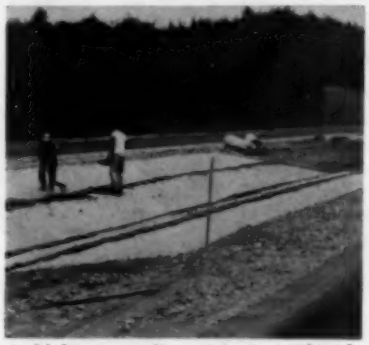
A heavy duty utility trencher with a vertical boom, the Century Trenchit enables the operator to work flush to walls, curbs and sidewalks. The self-propelled Trenchit has a walking speed of up to 2½ mph. All operating functions of the Trenchit are hydraulically controlled. It digs 4 to 12-in. wide with variable, selective depths.

Century Engineering Co., Waukesha, Wis.

Circle **No. 2-5** on the convenient reply card facing page 34.

Seeded Blanket

A seeded blanket, known as Troyturf, can be easily rolled out and tamped down to provide a grass covering in areas where other planting methods would not work. The blanket consists of a 16-ounce mat of jute, a bottom layer of special paper, seed, fertilizer, pH control, Vermiculite and organic mulch which provides a uniform distribution of 3½ tons per acre. Suited for difficult spots such as highway embankments, gullies and bridge abutments, the blankets will grow grass without special soil preparation, and are particularly suitable for areas where soil erosion or gullying is a problem. They are also practical in many areas where sodding is not.



A highway median strip is uniformly covered with the 54" seeded blanket.

After about one month the stand of grass has reached height of 4 to 6".

Any combination of seed, fertilizer, moisture control agents, etc., can be used for a specific location with special formulas and ingredients incorporated right in the blanket. The end of the seeded blanket is either placed under soil or staked at the ends, the blanket rolled out and cut to the desired length and the cut end held in place.

Horticultural Division, Troy Blanket Mills, 200 Madison Ave., New York, N. Y.

Circle **No. 2-6** on the convenient reply card facing page 34.

Asphalt Kettle

The KE-RA-20 rubberized asphalt kettle is designed to apply the hot material directly into the joint. The material is indirectly heated by heat transfer oil. A mechanical agitator is provided to mix materials. The unit will work right up to curbs, bridge rails and other obstructions. A swivel caster in the rear aids in maneuverability. A complete range of rubberized asphalt kettles is available holding from 18 gallons to 75 gallons.

Aeroil Products Co., Inc., 9 Wesley St., South Hackensack, N. J.

Circle **No. 2-7** on the convenient reply card facing page 34.

Contour Paver

The Contour Trac-Paver for narrow gauge paving of varying profiles, has a 5000-lb. hopper and is conveyor-fed from the hopper to distributing screws in front of the screed. The screed has an hydraulic driven vibrator which develops 3000 lb. force (at 2000 rpm) to the form section of the screed for compaction. The form section of the screed is replaceable for producing various shaped profiles. The screed is heated by L.P. gas burners. The paver is equipped with an hydraulic variable speed winch (2½ to 20 fpm) for propulsion when paving.

Trac - Machinery Corporation, Nunda, New York.

Circle **No. 2-8** on the convenient reply card facing page 34.

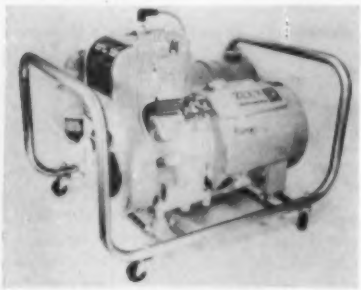
Portable Power

A heavy-duty portable electric generator which produces 3,000 watts of AC power, the Zeus, Model GW-300, will provide packaged power on the job site or in other remote locations where electric power is needed.

Electric power is generated by a permanent magnet rotating field. This operating principle completely eliminates all brushes, slip rings, or commutator. The permanent magnet, internally fan-cooled and corrosion protected, connects directly to the engine shaft with no coupling.

The Model GW-300 is rated at 3,000 watts, 115/230 volts, 60 cycle, single phase. Powered by a rope-started, 1-cylinder, 4-cycle, air-cooled gasoline engine, the unit will operate for approximately five hours of full load running on a fuel tank capacity of 2-3/4 gallons. It is equipped with a positive action fuel pump to permit connection to an auxiliary fuel tank of larger capacity.

The unit has two fuses for overload protection and three power



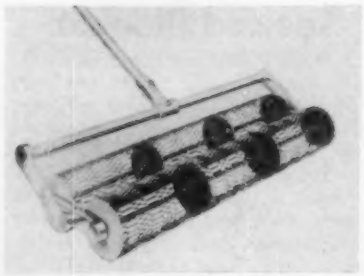
outlets—one 230 volt twistlock and two 115 volt 3-prong sockets. It will produce 3,000 watts in continuous duty at full 230 volts or 115 volts.

Borg-Warner Corp., Pesco Products Div., 24700 North Miles Rd., Bedford, Ohio.

Circle **No. 2-9** on the convenient reply card facing page 34.

Finishing Tool

This finishing tool tamps and levels a concrete slab in one operation. Using a 12-ft. (or longer) magnesium handle, you push the two, 5-in. diameter specially-designed rollers over a newly poured and screeded slab. The rollers, mounted 10 in. o.c. push large aggregate at the surface of the pour down into the mix about 1/32 in. to 1/16 in. This leaves a very thin layer of fat at the surface for smooth, easy finishing, but does not cause aggregate within the slab to settle.



Extension handles can be attached to the standard 12 ft. handle to tamp an area 36 ft. wide. The tool leaves a slightly keyed surface at the top of the mix for double course work, if desired. The roller pattern can be left in the slab for decoration and skid-proofing, if further finishing is not required.

The Rollerbug is made of magnesium and aluminum with only the bronze bearings and steel-patterned roller surface made of other metals. As a result, the tool is very lightweight and easy to handle. There are no moving parts but the rollers and no special maintenance. The roller is cleaned just as you clean any other tool that comes in contact with concrete.

Goldblatt Tool Co., 1910 Walnut St., Kansas City 8, Mo.

Circle **No. 2-10** on the convenient reply card facing page 34.

Rotary Compressor

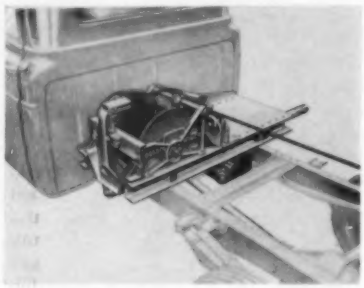
A 125 cfm rotary portable air compressor has increased horsepower and is designed to reduce service costs. The unit is powered by a Le Roi D226 wet sleeve engine. The 53-hp engine provides 60 percent power surplus. Features of the engine include stellite exhaust valves and valve seat inserts and valve rotators. At 1600 rpm, this slow-turning engine reduces both engine and compressor parts wear. Diesel and utility models of the 125 rotary are also available.

Sales Promotion Dept., Le Roi Div., Westinghouse Air Brake Co., Sidney, Ohio.

Circle **No. 2-11** on the convenient reply card facing page 34.

Truck Winch

This winch, model CL (for Constant Load), is an hydraulic unit that combines constant load, constant speed and constant horsepower with safe, efficient one-man operation. With the winch's remote control system, one lever operates the hydraulic valve, while the other operates the three-speed winch transmission. These levers can be located at any desired point to enable the operator to maintain close supervision over the entire job. Reversing is done under power, with unspooling at any speed up to the speed of the drum. The basic model CL is designed to handle either ½" or 7/16" diameter cable, but it can



Safety of operation of the winch is provided by an automatic worm brake.

be adapted to handle cable of other sizes. The drum holds 1,000 ft. of ½" cable, but the winch can be altered to hold an almost unlimited quantity of cable. The winch has a 15,000-lb. rating.

Broden Winch, Division of Nantec Corp., Broken Arrow, Oklahoma.

Circle **No. 2-12** on the convenient reply card facing page 34.

Chlorinizer

This compact chlorinizer is a one-piece unit which mixes chlorine gas with water and feeds the resulting solution. Wall mounted, it is useful for sterilizing drinking water, swimming pool water, sewage or waste treatment plant effluent and in other processes or operations where chlorine solutions are required. Only water pressure is needed to operate the unit. Completely safe in operation, the unit immediately stops should the water supply be interrupted. All parts in contact with chlorine gas and solution are made of corrosion resistant materials. Feed ranges of 2-28, 5-50, 10-100 lbs. per 24 hours can be provided by a single chlorinizer.

B-I-F Industries, 345 Harris Ave., Providence, R. I.

Circle **No. 2-13** on the convenient reply card facing page 34.

Cutting Electrode

The Eutec-Chamfer-Trode metal-cutting electrode, used with AC as well as DC welders, has application in chamfering, beveling, grooving, preparation for welding, making rough cuts and removal of hard-surfacing and frozen bushings.

Cham-fer-Trode AC-DC electrodes are formulated to provide a high-intensity, high-velocity blast to remove metal melted by their arc. The electrode can be used with any metal, particularly with very hard and highly-alloyed metals for which torch cutting is not practical.

Conventional electrode holders can be used, no oxygen nor compressed air is required, and no special operator training is needed. With many years of acceptance for use with DC welding equipment, these electrodes may now also be used where AC but not DC equipment is available.

Eutectic Welding Alloys Corp., 40-40 172nd Street, Flushing 58, New York.

Circle **No. 2-14** on the convenient reply card facing page 34.

Rubber Safety Cap

Surveyors and construction workers can use this safety device that permits the free use of steel gads, or pins, without the ever-present danger of flying steel particles. At the moment of contact, the end surface of the pin is covered by the hammer while the sides are covered by the rubber collar. This contains particles that might otherwise be projected outward, causing serious injury. Each device will last from four to six months under normal usage in rocky terrain.

Carson's Rubber Safety Cap, Fort Worth 7, Texas.

Circle **No. 2-15** on the convenient reply card facing page 34.

Engineer's Level

Designed for efficiency, accuracy and convenience in general engineering work such as roads, bridges, construction and tunnels, the Wild N-2 telescope, together with the level vial assembly, can be rotated about the optical axis for checking level adjustments quickly. Other features include 24 or 28-power telescope with coated lenses, internal

focusing, clamp and tangent screw, tilting screw with leverage and coincidence-reading tubular level.

Wild Heerbrugg Instruments, Inc., Port Washington, N. Y.

Circle **No. 2-16** on the convenient reply card facing page 34.

Sickle-Bar Mower

Tall grass, coarse weeds, heavy brush and even tree saplings up to 1-in. thick fall before this Terra 32-in. Sickle-Bar Mower, designed for use with the Terra Handle and Terra

Tractor. The transmission-propelled Terra Tractor has two forward speeds, one reverse speed and a neutral gear, all controlled by a convenient hand lever. Other attachments currently available include a plow and a set of cleated wheel rims for extra traction.

Moto-Mower, Inc., Subsidiary of Dura Corp., 625 South G Street, Richmond, Ind.

Circle **No. 2-17** on the convenient reply card facing page 34.

Scavenger Pump

The CP-71 Sludge Pump, a lightweight scavenger designed to handle liquid containing up to 15 percent solids, can eject 40 gpm at 200-foot head. Operating on the ejector principle, the CP-71 handles rock drill cuttings, sand or other solids without causing rapid wear of expensive internal parts. Air passing through the venturi sucks liquid into the pump. When the pump is full, air pressure forces the liquor out. The cycle is repeated automatically. Designed to be used with or without a suction hose, the CP-71 operates on an 85 cfm compressor.

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.

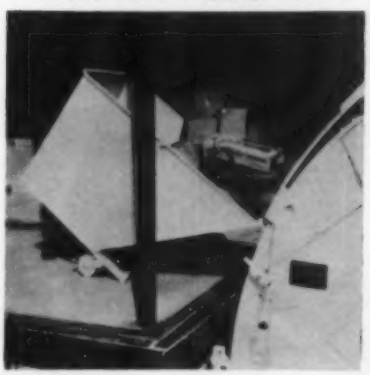
Circle **No. 2-18** on the convenient reply card facing page 34.

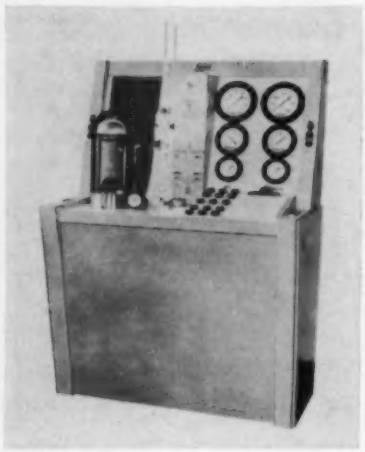
Dock Unloader

The 3-wheel Leach Combination Container, for dock or automatic unloading, is adaptable to any Leach Packmaster or Leach 2-R Packmaster in the field having the container attachment. Size of the new Combination Container is 1 cubic yard. Also available is another container without attachment arms which can be dumped from a dock.

The Elgin Corporation, 222 West Adams St., Chicago 6, Illinois.

Circle **No. 2-19** on the convenient reply card facing page 34.





Test Apparatus

This console model Triaxial shear apparatus incorporates many of the features outlined as being desirable for proper triaxial testing. All operating controls are located in one section of the console. Indicators for readings of pressure, load and operating speeds are also visible in the same area.

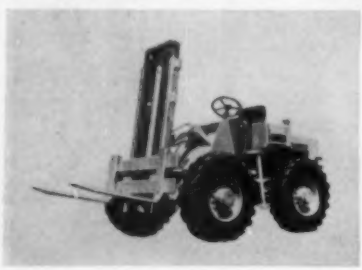
The triaxial cell is quickly detachable from the test frame. Its design eliminates the operating piston coming through the head of the chamber. Instead, the load application piston moves in from the base and readings of load applied to the specimen are obtained through a load cell mounted in the head of the testing chamber. Readings are transmitted to a large indicator on the control panel.

Soiltest, Inc., 4711 W. North Ave., Chicago 39, Ill.

Circle **No. 2-20** on the convenient reply card facing page 34.

Fork-Lift Tractor

A heavy-duty, four-wheel-drive fork-lift tractor with 6,000 lbs. capacity at 24-in. load center and 14-ft. maximum stacking height, Model H-30, is designed especially for heavy outdoor applications. The four-wheel-drive design gives both long wheelbase and wide tread with 12:00 x 24 tires. The rear (steering) axle mounting permits full axle oscillation of 18 degrees enabling the machine to operate on uneven surfaces.



Additional features include full power-shift transmission and matching torque-converter; power-steering and four-wheel hydraulic brakes which give the unit equal braking effort in both forward and reverse. Three speed ranges in each direction are available with speeds up to 21 m.p.h.

The Frank G. Hough Co., 761 Seventh St., Libertyville, Ill.

Circle **No. 2-21** on the convenient reply card facing page 34.

Loader Attachment

A front end loader attachment with 1¼-cu. yd. capacity is offered for the Kwik-Mix Hi-Lifter. The attachment digs 94″ wide, has 8½-ft. dumping height, 40° bucket roll back at ground level, 50° at dumping height and 9,000-lbs. breakout force. Maximum lifting capacity is 8,500 lbs. The entire front end operating mechanism pivots ahead of the

operator providing greatest possible safety to the operator. The front end loader features include all-weather, all-terrain 4-wheel drive traction; four equal size high flotation tires; power transfer differential; kick-out to 2-wheel drive for road use; 18 mph in either direction; 4-wheel power brakes; full-time power steering; and hydraulic control of front end attachment.

Kwik Mix Company, Division of Koehring Company, 235 West Grand Ave., Port Washington, Wisconsin.

Circle **No. 2-22** on the convenient reply card facing page 34.

Radio Transmitter

This fully-transistorized FM radio transmitter operates on standard VHF two-way mobile communications frequencies. The unit, called the Handie-Talkie Pocket Transmitter, is designed for operation on frequencies between 25-54 mc and 132-174 mc. It provides 500 milliwatts RF power output.

Eleven transistors in the various

stages of the unit provide reliability, low power consumption characteristics and compactness. The pocket transmitter weighs 14½ ounces, and measures 5½ in. by 2½ in. by 1⅛ in. The transmitter is completely self-contained, including microphone, antenna and batteries. Two antennas are available—a solid steel whip and a collapsible whip antenna. The unit can be operated interchangeably from either nickel-cadmium batteries or mercury cells.

Motorola Inc., Communications and Industrial Electronics Div., 4501 West August Blvd., Chicago 51, Illinois.

Circle **No. 2-23** on the convenient reply card facing page 34.

Earth Drill

A lightweight and easily portable power earth drill, this unit cuts clean straight holes for fence building, soil testing, landscaping or any other hole drilling job in any terrain or location. It is available as a complete unit utilizing the McCulloch One/41 chain saw engine, or as a separate attachment to a standard chain saw.

McCulloch Corp., 6101 West Century Blvd., Los Angeles 45, Calif.

Circle **No. 2-24** on the convenient reply card facing page 34.

NEWS OF ENGINEERS

ROLF ELIASSEN, has been made acting head of the Department of Civil and Sanitary Engineering at the Massachusetts Institute of Technology, replacing JOHN B. WILBUR.

PETER F. MATTEI is now Executive Director, Metropolitan St. Louis Sewer District, replacing WILLIAM Q. KEHR, who resigned July 1 to accept a position with the Public Health Service.

HAROLD A. HALLDIN has resigned as City Engineer of Ontario, Calif., to open an office as consulting engineer, broker and contractor, specializing in locating and planning land for investors and builders. His office will be in Ontario.

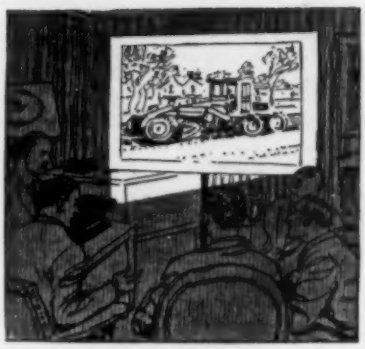
REX WHITTON, long time State Highway Engineer of Missouri, will be the next Federal Highway Administrator. He succeeds BERTRAM D. TALLAMY who will open a consulting engineering office in Washington.

EARL DEVENDORF, for forty years with the New York State Health Department and for many years Director of the Bureau of Environmental Sanitation, died in Schenectady, N. Y., Dec. 28.

MURRAY A. WILSON, a consulting engineer of Salina, Kans., will be the next president of the National Society of Professional Engineers.

HARRY B. BEARD, JR., of the consulting firm of Whitman, Requardt & Associates, Baltimore, Md., has been promoted to Project Engineer. A graduate of The Johns Hopkins University in 1948, Mr. Beard has specialized in highway and airport design and will direct this phase of the work for the firm.

Metcalf & Eddy, consulting engineers of Boston, Mass., have appointed five staff members as Senior Associates: CHARLES G. HAMMANN, CHARLES Y. HITCHCOCK, Jr., ALBERT B. RICH, MORTON SOLOMON and ARIEL A. THOMAS.



FILMS in Brief

Listed below are motion picture films of current interest to engineers, administrators and supervisors in the public works field. The companies providing these films have indicated that the films are available for appropriate use by PUBLIC WORKS readers. Requests for films should be made direct to the company listed with the film.

"Steel Pipe—At Your Service." The story of steel pipe—how it is manufactured, how it reaches the final job site and how it serves our modern world in so many useful ways. Bethlehem Steel Company, care of local office of Modern Talking Picture Service, Inc., 3 East 54th St., New York 22, N. Y.

"Highway Life Lines." The story of traffic paint and methods of testing, formulation and use. (16 min., color, sound, 16 mm.) Advertising Dept., Hercules Powder Company, Wilmington 99, Delaware.

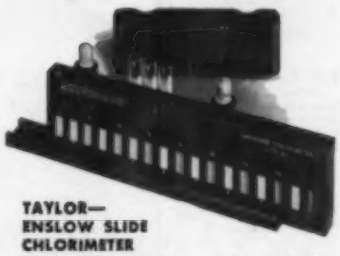
"A County Builds Soil-Cement." One county's solution to its road maintenance problems via the introduction of a planned program of soil-cement construction. (20 min., color, sound, 16 mm.) Local district office of Portland Cement Association, 33 West Grand Avenue, Chicago 10, Ill.

"Advantages of A. C. Welding." Explains principles and applications of AC welding with on-the-job demonstrations. (19 min., color, sound, 16 mm.) Motion Picture Department, Westinghouse Electric Corporation, 3 Gateway Center, Pittsburgh 30, Pa.

"TS-14 Scraper." Illustrates the versatility and operation of the 14 yd. scraper in small and medium-sized jobs. (12 min., color, sound, 16 mm.) Advertising Department, Euclid Division, General Motors Corporation, Cleveland 17, Ohio.

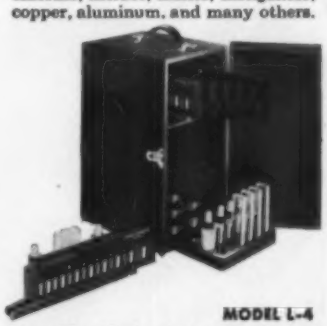
WHAT'S IDENTICAL ABOUT THESE TAYLOR COMPARATORS?

ALL GIVE YOU FAST, EASY, ACCURATE TESTS to aid water and sewage plant operations



TAYLOR—
ENSLOW SLIDE
CHLORIMETER
For making on-the-spot tests of pH, chlorine. Also ideal for control of swimming pool water.

TAYLOR
WATER ANALYZER
For accurate tests of fluoride, pH, chlorine, nitrate, nitrite, manganese, copper, aluminum, and many others.



MODEL L-4
For pH, chlorine tests. Consists of Enslow Slide Chlorimeter and 3 or more pH slides in carrying case.

ALL TAYLOR COMPARATORS HAVE GUARANTEED NON-FADING COLOR STANDARDS

SEE YOUR DEALER for Taylor Sets or immediate replacement of supplies.

FREE HANDBOOK, "Modern pH and Chlorine Control". Gives theory and application of pH control. Illustrates and describes full Taylor line.

W. A. TAYLOR AND CO.
7304 YORK RD. • BALTIMORE-4, MD.

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Robot mower developed by engineers of the South Carolina highway department is remote controlled by operator who rides on the truck while the self propelled rotary mower works on a steep embankment. Electric powered mower is cable connected to generator on truck.

WORTH SEEING

Ring compression theory of thin-walled corrugated metal culverts is demonstrated by Armco engineer who encloses coffee can, with ends removed, in wood blocks to simulate compacted backfill in full-scale metal structure.

Nighttime illumination is being increased five-fold on part of Miami's Biscayne Boulevard where 48 old street lights have been replaced by 95 modern fluorescents. These new lights are mounted on Kerrigan standards.

Reflectorized highway signs to welcome travelers to your city or county are offered by Alcoa. Free sign, up to a limit of five, goes with each minimum order of $500 worth of aluminum sign blanks or $1000 worth of finished signs.

Fred Waring, who retired the first of this year as Chief of the Division of Sanitary Engineering, the Ohio State Department of Health, was presented with a three-dimensional carving of his likeness to add to many other mementos of a distinguished career in sanitary engineering.

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by Arthur K. Akers

★ Accidental transposition of captions in our January column ascribed the picture of Mr. Charles Searight of Cataphote Corp. to Mr. Nechine of Chicago Pump. Our apologies to both.

★ **Edmund F. Buryan** now heads Minneapolis-Moline Co. as president and chief executive officer.

★ **Harvey A. Scribner,** president of Russell T. Gray Inc., advertising agency, Chicago, will be co-chairman, publicity committee, for 1963 ARBA Show, Chicago.

Mr. Scribner

Mr. Fosnot

★ **H. R. Fosnot** is a new general manager, American Machine & Foundry Co. of Connecticut to be responsible for AMF's over-all position in water conditioning. He was last with Graver Water Conditioning Co.

★ **Gordon R. Loveless** appointed manager of Chicago Bridge & Iron Company's major eastern plant, at Greenville, Pa. He was formerly at Salt Lake City plant.

★ **V. K. Gaston** appointed director of sales, Pak-Mor Mfg. Co., San Antonio, Texas, refuse-body manufacturers.

★ The Heil Co., Milwaukee, has acquired the materials handling equipment business of the Ingersoll Kalamazoo Division of Borg-Warner Corp. Principal product: the Load Lugger.

★ **William H. Wheeler** named general sales manager, Construction Equipment Division, Worthington Corp., at Holyoke, Mass.

★ The Permutit Co. announces the advancement of **Daniel J. Saunders,** vice president, to the General Manager's staff, Industrial Division.

★ **H. O. Ehrisman** appointed vice president and U. S. general sales manager by the Foxboro Company.

★ Walker Process Equipment Inc., appoints eight new sales representatives to increase their sales-engineering coverage.

★ **E. J. Goes** retired December 31 from his long-held advertising and publicity posts with the Koehring Company. He will continue, however, in a consulting phase of advertising.

★ **Dawes Walter** named manager of advertising, Pennsalt Chemicals Corp., Philadelphia.

★ General Electric Co., Lynchburg, Va., will spend over $1 million this year in enlarging its Communication Products Department headquarters. (2-way radio to you.)

★ **Dale E. Anderson** becomes assistant sales manager, with responsibility for advertising and sales promotion, in expansion of Maginniss Power Tool Co. at Mansfield, Ohio. Product: vibratory equipment used in public works.

★ Columbia-Southern Chemical Corp., formerly a wholly-owned subsidiary, becomes a division of the Pittsburgh Plate Glass Co., to operate under the name of Pittsburgh Plate Glass Co., Chemical Division.

★ Pipe Linings, Inc., of Wilmington, Calif., expands eastward, with new headquarters at 50 Church St., New York 7, in cooperation with the National Water Main Cleaning Co.

★ **William J. Grede,** elected chairman of the board, J. I. Case Co., Racine, Wis., will also continue as president and chief executive officer.

★ Boy Scout cocktail: Two of them, and a little old lady helps **you** across the street!

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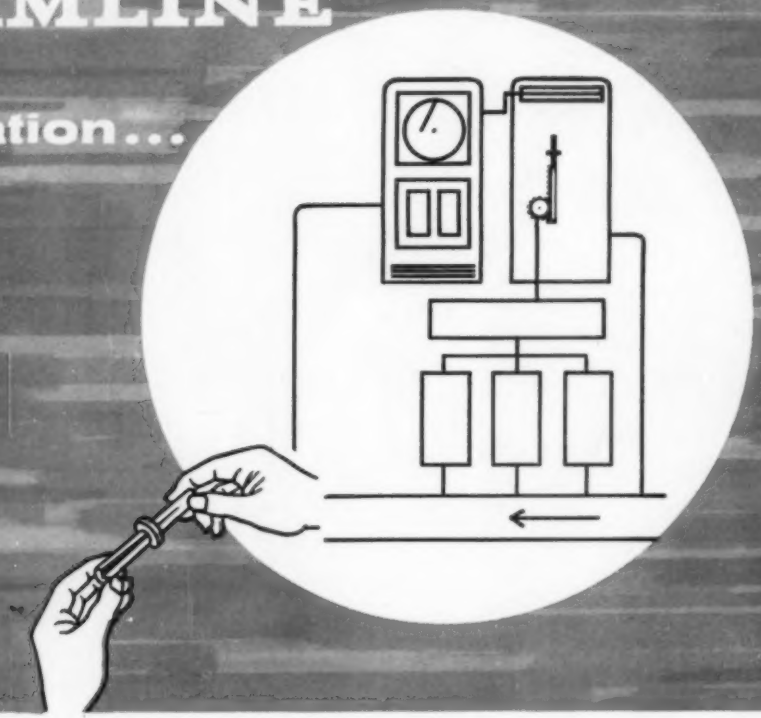

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